CLAYTON

FOOD HABITS

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BULLETIN 430

A FOUR-YEAR STUDY OF THE FOOD HABITS AND PHYSICAL CONDITION OF GRADE-SCHOOL CHILDREN IN NEWPORT, MAINE[1]

MARY M. CLAYTON

INTRODUCTION

The war has brought about certain changes in food production and consumption in Maine which no doubt already have had some effect on the general health and nutrition of the people. A general shortage of certain items, such as meat, might be expected to have a detrimental effect unless adequate substitutes are both available and consumed in sufficient quantity. However, a number of factors have been operating which have probably been favorable. Among these can be mentioned the following: increased income for many families; increased interest in food values (as a result of educational programs and food rationing); the availability of nutritious new foods, such as the soy products; the enrichment of cereal products; an increase in the number and size of home gardens; increased food preservation; and the development of the hot school lunch program. If the present general interest in health and nutrition can be maintained after the war there is reason to expect that nutritional defects which have been so common in the past may greatly decrease.

The present study gives a report of nutrition surveys of grade-school children which were made in four Maine towns between the years 1934-40. The results indicate that there is much which can be done to improve the health and nutrition of present and coming generations of Maine children.

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[1] Including comparisons with findings secured in three other Maine towns.

PREVIOUS STUDIES OF THE FOOD HABITS AND PHYSICAL CONDITION OF MAINE CHILDREN

In the fall of 1934 and spring of 1935 the Home Economics Department of the Maine Agricultural Experiment Station conducted a survey of the food habits and nutritional status of grade-school children in three Maine towns: Mars Hill, Jonesport, and Monmouth.[2] This survey gave evidence of the prevalence of the following types of nutritional defects in the three towns studied:

1. Bone defects resulting from rickets in infancy.
2. Malocclusion and dental caries.
3. Inflamed gums and other evidence of vitamin C deficiency.
4. Anemia.
5. Underweight.

The prevalence of vitamin C deficiency in a northern Maine town was also shown in recent studies by Crane and Woods (1941) and Murphy (1941).

The Experiment Station survey also gave evidence of some differences in the frequency of the occurrence of certain types of nutritional defects in the children of the different towns. This was to be expected, owing to differences in agriculture, industry, transportation facilities, and climate in the areas of the State represented.

PLAN FOR PRESENT STUDY

Purpose

The present four-year study, made in Newport, Maine, is partly a continuation of the survey previously reported (Clayton, 1940). However, in addition to satisfying the need for similar data from a fourth town located in a different type of environment, it seemed desirable to follow the food habits and physical condition of the same group of children over a period of years, in order to determine the effect of such factors as health education and changing economic conditions. Also, since several studies have recently been

[2] In Mars Hill the studies were continued in 1935-36 and 1936-37. The data secured in all three towns between fall 1934 and spring 1936 have been reported by Clayton (1940).

published in which consecutive physical measurements were made on the same groups of children (Meredith, 1935; Boynton, 1936; Dearborn et al., 1938; Jones and Bayley, 1941), the present study offered the opportunity to compare data for the growth and development of a group of Maine children with those secured in other states. In the present paper some of the findings for Newport will also be compared with those for the other three Maine towns and emphasis will be given to those which are of special importance to the future health of Maine people.

Choice of Location

The town of Newport, situated on the southwestern border of Penobscot County, was chosen for the following reasons: It is in a different area of the State and is of a somewhat different type from the towns previously studied; it has a grade school with a sufficiently large enrollment (approximately 250) to provide an adequate group for study; it is located within convenient traveling distance of Orono. In 1940 the population of the town of Newport was 2,052. Employment opportunities in the village include those offered by a shoddy mill, a saw mill, a wood turning factory, and a milk plant. Many small farms and several dairies are in the outlying districts. During the period when this study was made there was considerable unemployment in the town and many families were receiving town or W.P.A. assistance. The children attending the grade school came from the village and outlying districts.

Personnel

The study was carried on by the writer with the assistance of George I. Higgins, M.D., of Newport and Walter L. H. Hall, M.D., of Old Town; Dorothy Bryant, D.H., Associate Director Division of Dental Health, State Department of Health and Welfare, and Philip W. Woods, D.D.S., Director, Division of Dental Health, State Department of Health and Welfare.

Data Secured

The data secured include the results of physical examinations (Form 1, Appendix), physical measurements (Form 1, Appendix),

dental examinations (Form 2, Appendix), vitamin C studies, information secured at home visits (Form 3, Appendix), and diet records kept by the children at school (Form 4, Appendix).

ORDER OF WORK

1936-37. Work at Newport[3] was begun in the fall of 1936 with physical examinations by Dr. Higgins, physical measurements by the writer, and dental (teeth and gums) examinations by Miss Bryant. Also, for one week in the fall, all of the children above the third grade kept diet records at school. Only the physical measurements were repeated in the spring.

1937-38. Physical and dental examinations and physical measurements were made in the fall by the same personnel as in the fall of 1936. After these were completed, the writer visited the home of each child and secured information regarding family food production and preservation, and data regarding the past and present diets and health of the grade-school children. Gum examinations by Miss Bryant and physical measurements were repeated in the spring. Another set of diet records also was secured at that time. Six-hour saturation tests for vitamin C deficiency were made on a small group of children to test the practicability of the method.

1938-39. No physical examinations were made in the fall, owing to the illness of Dr. Higgins. However, dental examinations (teeth by Miss Bryant, gums by Dr. Woods) and physical measurements were made as in previous years. Also six-hour saturation tests were made on a group of 67 children. In the spring gum examinations were repeated by Dr. Woods, who also cooperated with the writer in making some curative tests (with vitamin C) on a group of 23 children with inflamed gums and 3 normal controls. Physical measurements were made as in the fall.

1939-40. Physical examinations (by Dr. Hall), dental examinations (teeth by Miss Bryant, gums by Dr. Woods), and

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[3] In 1936-37 studies were also continued in Mars Hill. These included observations on physical condition, physical measurements (McCloy, 1936, 1938), and diet records kept by the children at school for one week. All data were secured by the writer. These results will be briefly reported in the present publication.

physical measurements were made in the fall. In the spring gum examinations and physical measurements were repeated and diet records were secured as in the fall of 1936 and the spring of 1938.

PHYSICAL EXAMINATIONS

Examiners

Circumstances prevented the use of the same physician throughout the Newport study. Therefore, each year at the time of the spring measurements, the writer checked the findings made by the physician the previous fall (except in the spring of 1939, when she made independent observations). Since the writer's findings provided directly comparable data for the different years, they were used instead of those of the physicians in summarizing the physical defects.

Procedure for Examinations

Since physical measurements were made at the time of the physical examinations, the children were asked to urinate before being examined in order to bring their weights to a standard level. All clothes were removed in improvised dressing rooms and one piece examining gowns put on. The outline given in Form 1 (Appendix) was used for the examinations. The key used to describe the conditions found follows Form 1. (See p. 194.)

Methods of Examination

Posture. Posture was noted during both standing and walking and rated according to age.[4] A child was considered to have good posture if he appeared to be able to habitually hold himself erect, and to have adequately developed and well balanced muscles and well aligned bones.

Nutrition. Nutrition was rated from general appearance rather than specific tests. The usual criteria were used in judging,

[4] Certain characteristics of posture, such as protruding abdomen and hollow back (lordosis) are normally seen in children below age 6 but are considered as postural defects in older children.

the principal ones being amount of subcutaneous fat, muscular development, color and texture of skin and color of mucous membranes. In most cases the estimates referred to the child's state of nutrition at the time of the examination. However, when he was definitely undersized or showed signs of having had rickets these findings influenced the ratings given by the examiners, even though they were the result of faulty nutrition in the past. The condition of the teeth and gums was not considered in the estimate of nutrition.

Vision. Since vision tests were made each year by the room teachers these tests were not repeated by the physician or nutritionist.

Hearing. Audiometer tests were made each year by the visiting school nurse. The physician's judgment of hearing was based only on observation and questioning.

Ears. Examinations were made with an electric auriscope.

Nasal obstruction. Each nostril was closed in turn to see if the child could breathe through the open nostril.

Mouth. The physician's examination of the mouth was only superficial, since a detailed examination of the teeth and mouth was made by the dental hygienist.

Tonsils. A wooden tongue depressor and electric flash light were used. Note was made on the examination card under "Recommendations" if the physician thought the tonsils should be removed.

Heart and lungs. A stethoscope was used.

Abdomen. The children were examined in the standing position.

Height. The height board consisted of a wooden platform to the back edge of which a board was attached (by 2 adjustable screws). A steel tape measure, graduated in inches, was tacked to the center of this board. In obtaining a child's height he stood on the platform with heels, hips, upper part of back, and head touching the upright board, his hands hanging loosely and his head level. He was not told to "stand tall." The measurement was obtained by the use of a wooden square which was held level, and pressed down firmly on the top of the head. A flange on the right side of the vertical portion of the square fitted over the edge of the height board and helped to keep the square level. Readings were made to the nearest $\frac{1}{8}$ inch.

Weight. The children were weighed in their examining gowns, allowance being made for the weight of the gown. A nurse's portable platform scale (Continental Scale Works, Chicago) was used. The scale was carefully balanced at least twice daily and the weight obtained to the nearest ounce.

Other measurements. For a list of those obtained see p. 115 and Form 1 (Appendix). The techniques used were those of McCloy (1936, 1938).

Breathing capacity. No measurements were made.

Hemoglobin. No determinations were made.

Six-hour vitamin C saturation test. The procedure used for this test was a modification of that used by Harris and Abbasy (1937). It involved having the children save six-hour urine samples and keep diet records on two consecutive days at school.

On the first day the urine was voided at 8:30 A.M. and discarded. All urine voided after that time, up to and including 2:30 P.M., was collected in wide mouthed amber glass liter bottles with rubber stoppers. For a preservative, 20 ml. of glacial acetic acid and 20 gms. of powdered metaphosphoric acid were put into each bottle. Bottles were kept in portable picnic ice boxes between collections and until the urine was titrated later in the afternoon.

On the second day the procedure was the same as on the first day, with the exception that after the urine was voided at 8:30 A.M. 400 mg. of vitamin C was given in tablet form.

In order to determine the amount of vitamin C excreted each day the total volume of urine was measured and 2 to 5 ml. samples titrated[5] against a standardized solution of purified 2:6 dichlorobenzenoneindophenol (Eastman Kodak Company). For the titration the urine was measured into a 20 ml. beaker and the indicator solution run in until a pink color appeared which persisted 5 seconds. The appearance of this color was determined by comparison with another measured amount of urine. A 5 ml. burette with .02 ml. graduations was used. Merck's Cebione was used in the preparation of the standardized indicator solution.

[5] The urine was acidified before measuring by mixing 15 ml. with 5 ml. of 20 per cent acid (18 per cent trichloracetic and 2 per cent metaphosphoric). In recent work this acidification has been found to be unnecessary, since the urine is made sufficiently acid by the acetic and metaphosphoric acids used as preservatives. Preliminary dilution is sometimes necessary when the samples are very high in vitamin C.

TABLE 1

Summary of Physical Defects Found in Newport and Mars Hill Grade-School Children

	Newport				Mars Hill
	Spring 1937	Spring 1938	Spring 1939	Spring 1940	Spring 1937
Numbers in groups	240	231	201	210	230
	%	%	%	%	%
Bosses on skull	11.7	11.3	10.0	11.0	4.8
Defect of spine (more than slight)	5.0	3.9	2.5	2.4	1.3
One or more chest defects (more than slight)	23.0	24.7	16.4	11.4	15.2
Pronated feet* (more than slight)	43.3	50.2	45.8	41.4	25.7
Bowlegs	9.2	7.8	7.5	4.8	7.8
Knockknees	16.3	18.2	13.4	8.1	10.4
Fair posture	30.0	31.2	22.9	23.8	23.9
Poor posture	6.7	6.5	7.0	6.2	6.5
Fair nutrition	21.7	14.7	15.9	18.1	30.9
Poor nutrition	5.4	4.8	3.0	1.0	5.2
Obesity	.8	3.0	2.5	1.4	3.0
Pale skin	5.4	8.7	3.5	4.8	5.2
Rough dry skin	23.3	16.5	10.9	13.8	11.7
Acne	3.8	3.9	5.5	3.8	1.7
Pale mucous membranes	.8	6.1	0.0	0.0	.4
Strabismus	1.7	3.5	3.0	2.4	.4
Eardrum defects†	3.3	2.2	No exam.	5.7	No exam.
Nasal discharge	34.2	22.5	25.9	23.8	39.6
Mouth breathing	17.1	11.3	13.4	15.2	16.5
Cough	3.3	6.9	7.5	4.3	6.5
Enlarged or infected tonsils	23.8	27.7	20.4	21.9	33.9
Tonsils removed	21.3	24.2	25.4	24.8	24.3
Enlarged thyroid	4.2	3.5	4.0	3.3	No exam.
Failed to gain between fall and spring examinations	2.6	.9	5.5	2.9	6.8
Underweight by McCloy standards (more than 6% below standards)	30.5	36.4	37.3	36.2	51.5

* See footnote 9, p. 91.

† From previous fall examination by physician.

Vitamin C test for cure of inflamed gums. The children who were used for these tests had received gum examinations by Dr. Woods six days before the tests were begun. The following criteria[6] were used in rating the degree of inflammation found:

[6] For a more complete explanation of the criteria used in judging gum inflammation see Crane and Woods (1941, p. 8).

\+ Inflammation is limited to the interdental papillae.
++ Inflammation extends through the interdental tissues and up into the tissues covering the crest of the alveolar ridge.
+++ Severe inflammation extends through the interdental papillae and through all the tissues of the alveolus.
++++ The severe +++ reaction in the mouth is accompanied by pain in the joints, hemorrhages in the skin, lassitude, and possibly other evidence of scurvy.

In certain cases there was localized inflammation around individual teeth associated with caries, malocclusion, or heavy deposits of calculus. This localized inflammation was not included in the + to 4+ rating but each case was described individually.

Before the tests were begun a visit was made at the home of each child chosen for the test and the mother's permission and promise of cooperation secured. Record sheets, on which were listed the consecutive days of the test, were left with the mothers. The children were asked to take one 100 mg. vitamin C tablet[7] each day and at the same time to place a check mark on the record sheet opposite the proper day. This gave a record of the number of tablets taken, which could be compared with the number of tablets left in the bottle at the end of the experiment.

The tests lasted 21 days and gum examinations were repeated on the 10th and 21st days.

RESULTS OF PHYSICAL EXAMINATIONS

The results of the spring physical examinations made in Newport in 1937, 1938, 1939, and 1940[8] and in Mars Hill in 1937 are briefly summarized in Table 1. The results of the examinations made by physicians in Mars Hill, Jonesport, and Monmouth in the spring of 1935 (Clayton, 1940, p. 15) and by the

[7] The vitamin C tablets for these tests were supplied by the United Drug Company of Boston.

[8] As previously stated (p. 85), these examinations were made by the nutritionist, who, as far as possible, checked the findings made by the physician the previous fall.

writer in the spring of 1937 are given in Table 2. The results will be discussed in the order in which the headings are given on the examination card (Form 1, Appendix).

TABLE 2

Summary of Physical Defects Found in Grade-School Children in Four Maine Towns

	Mars Hill Spring 1935	Jonesport Spring 1935	Monmouth Spring 1935	Newport Spring 1937
Total number of children examined	205	227	176	240
	%	%	%	%
One or more bone defects	32.2	47.6	37.5	67.5
Bosses on skull	2.9	.9	1.7	11.7
Defect of spine (more than slight)	6.3	5.3	2.8	5.0
One or more chest defects (more than slight)	11.7	13.2	14.8	23.0
Pronated feet* (more than slight)	14.6	37.9	20.4	43.3
Bowlegs	6.3	7.5	7.9	9.2
Knockknees	1.0	.9	.6	16.7
Fair posture	30.2	10.1	15.3	30.0
Poor posture	6.4	4.0	3.4	6.7
Fair nutrition	32.2	21.2	18.8	21.7
Poor nutrition	6.3	1.3	3.4	5.4
Obesity	2.0	.4	2.3	.8
Skin lesions	4.9	12.3	12.5	13.3
Strabismus	4.9	.4	1.7	1.7
Eardrum defects†	8.4	7.3	21.0	3.3
Nasal discharge	3.4	37.9	33.5	34.2
Mouth breathing	18.5	33.5	38.1	17.1
Enlarged or infected tonsils	29.8	24.2	13.1	23.8
Tonsils removed	19.0	11.0	25.0	21.3
Enlarged thyroid gland	1.0	3.9	5.7	4.2
Failed to gain between fall and spring examinations	7.3	5.3	17.0	2.6

* See footnote 9, p. 91.

† From previous fall examination by physician.

Bone development. As will be seen from the tables, bone defects were found very frequently in the Newport children, but the same types of defects were seen in the children from the other towns. The majority of the defects were those which may result from rickets in infancy. These include bosses on the skull, high, narrow chests, flaring ribs, bowlegs, knockknees, and pronated or

flat feet.[9] In Newport, in the spring of 1940, there was an apparent decrease in the frequency with which these defects occurred in the group as a whole. This improvement is difficult to explain. It may have been due to chance variations in the group, to the prevention of rickets in a greater number of children by the adequate use of vitamin D, calcium and phosphorus during pregnancy and infancy, or to the fact that when general nutrition is good, bone defects resulting from mild rickets may be hidden by the soft tissues and may not be noted in the examination.

Pronated feet occurred almost twice as frequently in the Newport children as in the Mars Hill group (Table 1); but from Table 2 it will be seen that this defect was also very common in the Jonesport children.

It is difficult to explain the high incidence of pronated feet among Maine children. According to Dr. Carl W. Ruhlin,[10] orthopedic surgeon of Bangor, any of the following may be responsible for the condition:

1. Postural changes, as seen in young children. Up until about the age of six most children are knockkneed and show pronation (Sweet, 1938). This results from the effort to maintain body balance. The knockkneed posture causes the child to turn his toes out and to support his weight on the inside of his feet.
2. Postural defects which affect body balance. Too much weight on the inside of the foot causes stretching of the muscles and ligaments and allows the arches to flatten out. Bowlegs and knockknees especially, are often responsible.
3. Nutritional deficiencies, such as insufficient protein or insufficient vitamin D (sometimes also calcium or phosphorus), resulting in rickets. Either type of deficiency may result in pronation by causing weakness of the ligaments in the arches of the feet and weakness of the foot and leg muscles.
4. Muscle imbalance. According to Osgood (1942) this usually results from underdevelopment of the muscles which

[9] Only a small proportion of the children with pronated feet showed the extreme degree of pronation seen in the condition ordinarily called flatfoot by the medical profession.

[10] Personal communication.

raise the arches of the feet. It may also result from fatigue, poor muscle tone after illness, unreasonably long hours of standing or walking on very hard surfaces, or improper shoes. Extreme muscle imbalance may also result from paralysis.

5. Inherited tendency to flatfoot. This is characterized by unusual flexibility in all of the joints.

Pronation, when due to postural changes, usually disappears during preadolescence when good posture becomes established. Other types may persist.

TABLE 3

Association of Knockknees and Bowlegs with Pronation in Grade-School Children in Newport, Maine

	Girls									
Ages*	6 & 7		8 & 9		10 & 11		12 & 13		14 & 15	
No. examined	89		105		108		94		38	
	No.	%	No.	%	No.	%	No.	%	No.	%
Total with pronation	38	42.7	41	39.0	54	50.0	43	45.7	14	36.8
Pronation + knockknees	11	12.4	10	9.5	10	9.3	6	6.4	2	5.3
Pronation + bowlegs	1	1.1	2	1.9	0	0.0	2	2.1	3	7.9

	Boys									
Ages*	6 & 7		8 & 9		10 & 11		12 & 13		14 & 15	
No. examined	75		82		108		119		51	
	No.	%	No.	%	No.	%	No.	%	No.	%
Total with pronation	34	45.3	30	36.6	43	39.8	67	56.3	30	58.8
Pronation + knockknees	8	10.7	5	6.1	4	3.7	8	6.7	6	11.8
Pronation + bowlegs	0	0.0	0	0.0	7	6.5	9	7.6	7	13.7

* To nearest birthday.

It is difficult to determine how much of the pronation shown by the Newport children was due to postural changes and how much to other causes. The knockknees associated with postural

changes might be expected to persist in some cases beyond the age of 6 years—possibly to age 8—and to be responsible for the delay in the disappearance of pronation. From age 8 up, however, the occurrence of knockknees can probably be related to rickets. Bowlegs (physiological) are normally seen in infants but should straighten when the child begins to walk (Sweet, Watson, and Strafford, 1928). If this does not occur rickets is usually responsible.

Table 3 indicates the frequency with which pronation, associated with either knockknees or bowlegs, occurred in the Newport children during the four years of this study. It will be seen that in all age groups there were many cases of pronation not accompanied by either knockknees or bowlegs. Knockknees occurred more often than bowlegs and, in the girls, tended to decrease in frequency with increase in age. In the boys there was a decrease through age 11 and then an increase. Bowlegs increased in frequency with age.

Uncorrected pronation in children may become progressively worse in later life and cause considerable pain and disability. Therefore children with this condition should be under the care of a competent physician who may prescribe diet, exercise, corrective shoes, or possibly surgery in extreme cases. Well fitting shoes are a particularly important item in foot health and children with weak feet should not be permitted to wear sneakers, lumberman's rubbers, or other very flat shoes.

Posture. Postural defects were sometimes seen in children who appeared to be well nourished, but occurred most often in those rated as having fair or poor nutrition. Such children often suffer from muscular weakness and fatigue and are therefore unable to maintain good posture. In some cases there were actual deformities of the bones of the chest or back which prevented the child from standing erect. Knockknees or bowlegs were often responsible for poor alignment of the legs and feet.

Table 2 shows that there were more children with good posture in Jonesport and Monmouth than in Mars Hill and Newport. In Newport postural defects were more often seen in the girls than in the boys during all four years, but in Mars Hill there was very little sex difference.

Nutrition. From Table 1 it will be seen that in 1937 there were more children in Mars Hill in fair and poor nutritional condi-

tion than in Newport during any of the four years. Also, it is evident that during the last three years in Newport there were fewer malnourished children than during the first year. Although the percentage of children in Mars Hill who had fair or poor nutrition was quite high in the spring of 1937 (36.1%), there was an improvement over the previous spring when 42.8% of the children were found by the writer to have fair or poor nutrition (Clayton, 1940, p. 15).

A comparison of the percentage of Newport and Mars Hill children who had fair or poor nutrition with the percentage who were underweight by the McCloy standards shows that the percentage who were underweight was higher than the percentage who were judged to have fair or poor nutrition. This was especially true for the girls in both towns. The most plausible explanation for this is that the examiner was more lenient in judging the girls than the boys. This leniency was probably due to the fact that when a large percentage of a group runs below a generally accepted standard the tendency is to lower the standard.

Skin. It will be seen from Table 1 that the percentage of children with pale skin, suggestive of anemia, was not very high in either Newport or Mars Hill, but that in Newport it was highest in the spring of 1938 when the percentage of children with pale mucous membranes was also highest. In both towns the girls showed pale skin much more often than the boys. Tests made in Mars Hill in the spring of 1936 showed 35% of the children to be below 80% in hemoglobin (Clayton, 1940).

The texture of the skin was noted particularly in order to detect any unusual dryness or evidence of follicular hyperkeratosis, which may occur in vitamin A (or C) deficiency. Table 1 shows that in the spring of 1937 almost one-fourth of the Newport children had rough, dry skin. Many also had some evidence of follicular hyperkeratosis, especially on the arms and legs. However, since the majority had been exposed to severely cold weather during the winter and were suffering from chapping of the skin it was difficult to tell how much of the dryness and roughness had a nutritional cause.

Among the skin lesions noted in Newport (1937-40) and Mars Hill (1937) there were a number of cases of scabies, acne, and cold sores. One Newport child had psoriasis and another icthyosis. The child with icthyosis had eaten no butter for four

years, so it is probable that the condition was associated with a vitamin A deficiency. Very few skin lesions definitely suggestive of riboflavin deficiency and none suggestive of niacin deficiency were noted.

Ear drum defects. The ear drum defects noted were perforations and scarring which had resulted from inflammation of the middle ear during colds.

Nasal discharge. It will be noted from Table 1 and 2 that nasal discharge, usually accompanying colds, occurred very frequently in all four towns.

Mouth breathing. Many of the children with mouth breathing had nasal discharge and stated that they had colds. In certain cases permanent mouth breathing was caused by the presence of adenoids; but, since examination (other than noting the presence or absence of obstruction to breathing) was not made, it was impossible to determine the total number of children who had adenoids.

Coughs. The majority of children who had coughs either said they had colds or were just getting over them.

Enlarged or infected tonsils. Defective tonsils were extremely common in all four towns, but were seen a little more frequently in Mars Hill than in the other towns. This defect was least frequent in Monmouth. Children in all towns were very apt to have tonsillar infection or enlargement along with colds in the nose. The lowest percentage of children with tonsils removed was in Jonesport. (See Tables 1 and 2.)

Enlarged thyroid gland. A few cases of simple enlargement of the thyroid were seen in all four towns, the lowest percentage being in Mars Hill and the highest in Monmouth. The percentage for Jonesport (spring 1935) and for Newport (spring 1937-40) was about the same. Newport girls were affected more frequently than boys. Griffith and Mitchell (1934, p. 1066) state that goiter is an expression of iodine starvation and may result from such factors as puberty, infections, intoxications, defective utilization of iodine, or low iodine intake.

Failure to gain between fall and spring examinations. Table 1 shows that in Newport, during three of the four years of this study, there were very few children who failed to gain. The percentage was highest in the spring of 1939 when it almost equaled that for Mars Hill in 1937. In 1939 twenty-five New-

TABLE 4

Illnesses and Operations Between Fall and Spring Examinations as Reported by Mars Hill and Newport Grade-School Children

Numbers in groups	Mars Hill		Newport							
	Spring 1937		Spring 1937		Spring 1938		Spring 1939		Spring 1940	
	230		240		231		201		210	
	No.	%	No.	%	No.	%	No.	%	No.	%
Abscess on face	1	.4	0	0.0	0	0.0	0	0.0	0	0.0
Adenoidectomy	0	0.0	0	0.0	1	.4	0	0.0	0	0.0
Appendectomy	1	.4	2	.8	2	.9	0	0.0	3	1.4
Appendicitis	1	.4	2	.8	1	.4	1	.5	4	1.9
Asthma	1	.4	0	0.0	1	.4	0	0.0	0	0.0
Backache	0	0.0	1	.4	0	0.0	0	0.0	0	0.0
Bronchitis	0	0.0	1	.4	0	0.0	0	0.0	0	0.0
Carbuncles	0	0.0	0	0.0	1	.4	1	.5	0	0.0
Chicken pox	0	0.0	0	0.0	0	0.0	0	0.0	1	.5
Colds	117	50.9	112	46.7	137	59.3	106	52.7	126	60.0
Cough	3	1.3	0	0.0	1	.4	0	0.0	0	0.0
Digestive upset	21	9.1	17	7.1	30	13.0	14	7.0	30	14.3
Eyes	2	.9	1	.4	3	1.3	0	0.0	0	0.0
Eyelids: stys	0	0.0	0	0.0	1	.4	0	0.0	4	1.9
Earache	1	.4	9	3.8	4	1.7	4	2.0	7	3.3
Fatigue	0	0.0	1	.4	0	0.0	0	0.0	0	0.0
Feet, sore	1	.4	0	0.0	0	0.0	0	0.0	0	0.0
Glands, cervical	0	0.0	0	0.0	4	1.7	0	0.0	1	.5
Headache	7	3.0	5	2.1	15	6.5	7	3.5	8	3.8
Heart	1	.4	0	0.0	0	0.0	0	0.0	0	0.0
Influenza	4	1.7	14	5.8	4	1.7	25	12.4	6	2.9
Jaundice	0	0.0	0	0.0	1	.4	0	0.0	0	0.0
Kidneys	1	.4	0	0.0	1	.4	2	1.0	0	0.0
Legache	0	0.0	1	.4	1	.4	0	0.0	0	0.0
Leg weakness	0	0.0	0	0.0	0	0.0	0	0.0	1	.5
Liver	0	0.0	0	0.0	1	.4	0	0.0	0	0.0
Measles	0	0.0	0	0.0	1	.4	0	0.0	41	19.5
Mouth, ulcers	0	0.0	0	0.0	0	0.0	0	0.0	1	.5
Mouth, sore	0	0.0	1	.4	0	0.0	0	0.0	0	0.0
Mumps	0	0.0	0	0.0	1	.4	0	0.0	0	0.0
Neck, stiff	1	.4	0	0.0	0	0.0	0	0.0	0	0.0
Neuralgia	0	0.0	0	0.0	1	.4	0	0.0	0	0.0
Nose bleed	0	0.0	0	0.0	0	0.0	0	0.0	1	.5
Pleurisy	0	0.0	0	0.0	0	0.0	0	0.0	1	.5
Pneumonia	0	0.0	5	2.1	0	0.0	1	.5	1	.5
Rheumatism	0	0.0	0	0.0	0	0.0	0	0.0	1	.5
Rupture	0	0.0	0	0.0	0	0.0	0	0.0	1	.5
Skin (?)	0	0.0	0	0.0	0	0.0	1	.5	0	0.0
Skin: Itch	0	0.0	1	.4	0	0.0	0	0.0	0	0.0
Throat, sore & tonsillitis	4	1.7	9	3.8	12	5.2	8	4.0	8	3.8
Tonsillectomy & adenoidectomy	0	0.0	2	.8	1	.4	0	0.0	0	0.0
Toothache	8	3.5	6	2.5	7	3.0	4	2.0	4	1.9
Whooping cough	0	0.0	0	0.0	0	0.0	2	1.0	1	.5
Worms	0	0.0	0	0.0	1	.4	1	.5	0	0.0

port children had influenza between fall and spring (Table 4). This disease apparently caused a greater weight loss than the epidemic of measles in 1940. The epidemic of German measles at Monmouth in the spring of 1935 was chiefly responsible for the failure of 17% of the children to gain weight.

Underweight by the McCloy standards. Table 1 shows that slightly over one-third of the Newport children and about one-half of the Mars Hill children were underweight according to the McCloy standards. About one-half as many boys as girls were underweight in Newport and two-thirds as many boys as girls in Mars Hill. This large sex difference may possibly be explained as being due to the fact that boys are inclined to eat more than girls; so, when the diet is of poor quality the boys get more of the essential nutrients than the girls.

Illnesses between fall and spring examinations. Table 4 shows that the illnesses most frequently reported by the children were colds, influenza, sore throat and tonsillitis, earache, digestive upsets, headache, and toothache.

Six-hour vitamin C saturation tests. For a discussion of the results of these tests, see p. 130.

Vitamin C tests for cure of inflamed gums. For a discussion of the results of these tests see p. 132.

PHYSICAL MEASUREMENTS

Standing height and weight were two measurements which were made on all of the children studied in the four Maine towns. Therefore, a study of the results of these measurements gives opportunity for the consideration of annual differences in the averages for the Newport and Mars Hill groups and for comparing the averages for each of the four towns with each other and with the U. S. averages of Collins and Clark (1929), the Iowa averages of Meredith (1935) and Boynton (1936), and those of Gray and Ayres (1931). See Charts 1, 2, 3, and 4 and Tables 9, 10, 15, and 16 (Tables in Appendix).

The 30,000 children studied by Collins and Clark were from public schools in various parts of the U. S. and were of native white stock.

The 1243 Iowa City boys studied by Meredith and the 1241 Iowa City girls studied by Boynton were from the schools of the

TABLE 5

Average Heights of Mars Hill, Maine Girls

Fall age†	1934–1935				1935–1936				1936–1937			
	Number		Average		Number		Average		Number		Average	
	Fall	Spring*	Fall	Spring*	Fall	Spring*	Fall	Spring*	Fall	Spring*	Fall	Spring*
			in.	in.			in.	in.			in.	in.
5	5	5	43.4	44.2	5	4	41.0	41.8	3	3	42.4	42.5
6	12	11	44.1	45.2	11	12	45.2	46.3	8	9	45.4	45.9
7	18	18	45.5	46.4	12	11	46.8	48.2	15	14	46.3	47.4
8	17	17	48.1	48.9	19	17	47.7	48.8	15	16	49.1	50.0
9	13	11	51.0	51.6	18	17	50.3	51.2	19	19	50.0	50.9
10	11	11	53.0	53.9	11	11	53.0	54.4	16	16	52.3	53.4
11	18	18	55.1	56.2	15	15	54.8	56.1	18	16	54.2	55.4
12	14	13	56.5	57.5	14	13	57.7	59.0	16	16	58.0	58.9
13	13	13	58.9	59.7	7	6	60.0	61.5	12	12	59.2	60.1
14	5	5	60.7	61.3	5	5	60.0	60.6	9	7	60.6	60.5
15	—	—	—	—	1	1	64.8	65.0	3	2	63.8	64.4

† To nearest birthday.
* Spring and fall age groups kept the same.

TABLE 6

Average Heights of Mars Hill, Maine Boys

Fall age†	1934–1935				1935–1936				1936–1937			
	Number		Average		Number		Average		Number		Average	
	Fall	Spring*	Fall	Spring*	Fall	Spring*	Fall	Spring*	Fall	Spring*	Fall	Spring*
			in.	in.			in.	in.			in.	in.
5	5	5	43.0	44.0	1	1	42.9	43.6	2	2	43.5	44.5
6	9	9	44.7	45.9	12	11	45.4	46.5	6	6	45.1	46.3
7	7	7	47.0	48.0	7	5	46.6	47.9	17	15	47.5	48.6
8	15	13	48.6	49.5	14	13	49.7	51.0	8	8	48.9	50.1
9	9	9	50.5	51.2	12	11	50.8	52.0	14	14	52.1	52.8
10	15	14	53.3	54.2	12	10	52.7	54.2	13	12	52.2	52.9
11	6	6	55.2	55.9	11	11	54.7	55.6	12	12	54.4	55.3
12	8	8	57.1	57.9	6	4	57.9	58.2	15	15	57.2	58.1
13	10	9	59.8	61.3	6	5	59.1	60.8	5	5	57.2	58.0
14	2	2	60.8	61.9	5	4	62.4	64.2	8	4	62.6	64.5
15	1	1	63.8	65.2	1	1	64.6	65.8	5	4	63.9	65.9

† To nearest birthday.
* Spring and fall age groups kept the same.

State University of Iowa. The Iowa groups were described as being "homogeneous as to geographic location, rather superior in cultural and socio-economic status, and not widely diverse as to racial stock."

The boys and girls studied by Gray and Ayres were healthy, white, private school children of superior socio-economic status from various parts of the U. S. The data include 3110 measurings on boys and 1473 on girls. These children showed considerable variability in race ancestry but 46.2 percent of the group were classed as "Old Americans" (four grandparents born in the U. S.).

HEIGHT

Annual Differences in Mars Hill Height Averages (1934-37)

(Girls and boys) Tables 5 and 6 show that for both girls and boys the fall height averages for each age group were about the same in each of the three years. The averages for spring 1936 tended to be slightly higher than those for the other two years. This was the year when an educational campaign for better nutrition was carried on in Mars Hill under the auspices of the Maine Agricultural Experiment Station (Clayton, 1940, p. 5). However, the differences between the averages for spring 1936 and spring 1935 and 1937 were not statistically significant.[11]

Annual Differences in Newport Height Averages (1936-40)

(Girls) Table 7 shows that the fall averages for the girls tended to be slightly higher in 1939 than in the other three years

[11] A significant difference is one which would occur, due to chance alone, only 5 times out of 100; a highly significant difference is one which would occur, due to chance alone, only 1 time out of 100. The significance of the average difference between pairs of means (for ages 5 to 15) was expressed as a ratio between the observed average difference and the standard error of this average difference. Significance was determined by reference to a table (Snedecor, 1940, p. 58), with consideration given to the number of degrees of freedom.

TABLE 7

Average Heights of Newport, Maine Girls

Fall age†	1936–1937				1937–1938				1938–1939				1939–1940			
	Number		Average		Number		Average		Number		Average		Number		Average	
	Fall	Spring*	Fall	Spring*	Fall	Spring*	Fall	Spring*	Fall	Spring*	Fall	Spring*	Fall	Spring*	Fall	Spring*
			in.	in.			in.	in.			in.	in.			in.	in.
5	7	6	42.1	43.5	8	8	41.9	43.2	7	4	41.1	43.4	5	4	42.9	43.8
6	17	17	43.8	44.9	13	11	44.4	45.8	14	9	43.8	45.3	13	12	43.5	44.8
7	10	10	46.7	47.4	20	20	46.0	47.2	13	11	46.8	48.5	14	12	45.7	46.8
8	14	12	47.9	48.8	9	9	48.6	49.7	17	16	48.2	49.5	14	13	48.9	49.9
9	20	19	50.9	51.6	14	14	50.3	51.5	11	11	50.7	51.8	17	16	50.4	51.7
10	10	9	52.0	53.1	18	17	52.8	54.5	16	15	53.1	54.5	9	9	52.6	53.6
11	12	12	54.8	55.8	13	13	54.7	55.9	13	11	55.6	57.5	15	15	55.5	56.7
12	19	18	57.5	58.8	11	10	57.2	58.1	15	12	57.9	59.5	12	11	58.4	59.5
13	8	8	60.6	61.5	14	14	59.9	61.1	11	8	59.8	61.5	9	7	60.0	60.4
14	3	3	61.0	61.5	4	4	61.3	61.9	7	6	61.2	61.9	5	4	61.7	61.5
15	2	2	61.2	61.5	3	2	62.3	61.8	2	2	61.5	61.6	3	2	61.1	61.0

† To nearest birthday.

* Spring and fall age groups kept the same.

TABLE 8

Average Heights of Newport, Maine Boys

Fall age†	1936–1937				1937–1938				1938–1939				1939–1940			
	Number		Average		Number		Average		Number		Average		Number		Average	
	Fall	Spring*	Fall	Spring*	Fall	Spring*	Fall	Spring*	Fall	Spring*	Fall	Spring*	Fall	Spring*	Fall	Spring*
			in.	in.			in.	in.			in.	in.			in.	in.
5	2	2	43.5	44.4	1	1	44.0	45.3	6	2	42.8	42.4	7	6	42.9	44.1
6	14	13	44.8	46.1	10	9	45.3	46.2	8	8	45.1	46.5	16	15	45.0	46.0
7	9	9	47.9	48.7	15	13	47.7	49.2	11	8	46.9	48.8	11	11	46.8	48.6
8	16	14	48.8	49.2	9	7	50.1	51.6	15	14	50.2	51.3	10	9	49.3	50.7
9	17	17	51.0	51.8	13	12	50.4	51.3	8	8	52.6	53.8	13	11	52.2	53.9
10	11	11	52.9	53.6	21	20	53.3	54.4	12	11	51.9	53.2	9	9	54.3	55.2
11	24	23	55.3	56.0	8	5	54.4	54.9	17	17	55.1	56.3	13	13	54.3	55.4
12	17	17	56.6	57.4	24	21	57.3	58.7	5	5	56.2	57.5	18	18	57.1	58.1
13	5	5	60.0	61.1	14	14	58.4	59.9	19	18	59.9	61.3	8	7	59.9	61.0
14	9	8	62.4	63.4	5	5	60.3	62.2	5	4	58.4	59.5	9	7	61.7	63.0
15	2	2	66.8	67.5	3	3	63.1	64.8	4	3	63.7	65.1	1	1	61.0	63.3

† To nearest birthday.

* Spring and fall age groups kept the same.

but the differences were not significant. The spring averages were highest in 1939 and lowest in 1937. The differences between the spring averages for these two years were highly significant. The low averages for spring 1937 may possibly be associated

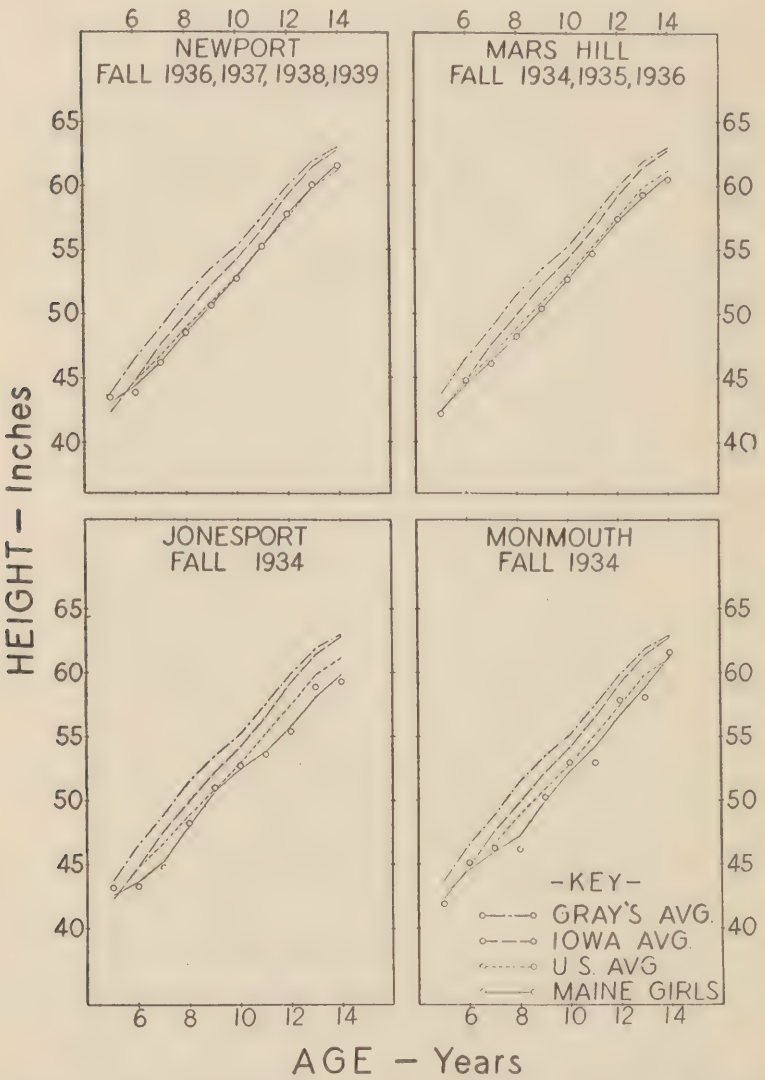

CHART 1. Height of Maine girls. Fall averages for four towns compared with U. S., Iowa, and Gray's averages. (See Table 9, Appendix.)

with the prevalance of unemployment during that year and the resulting inability of many families to secure adequate food.

(Boys) Table 8 shows some differences in the fall as well

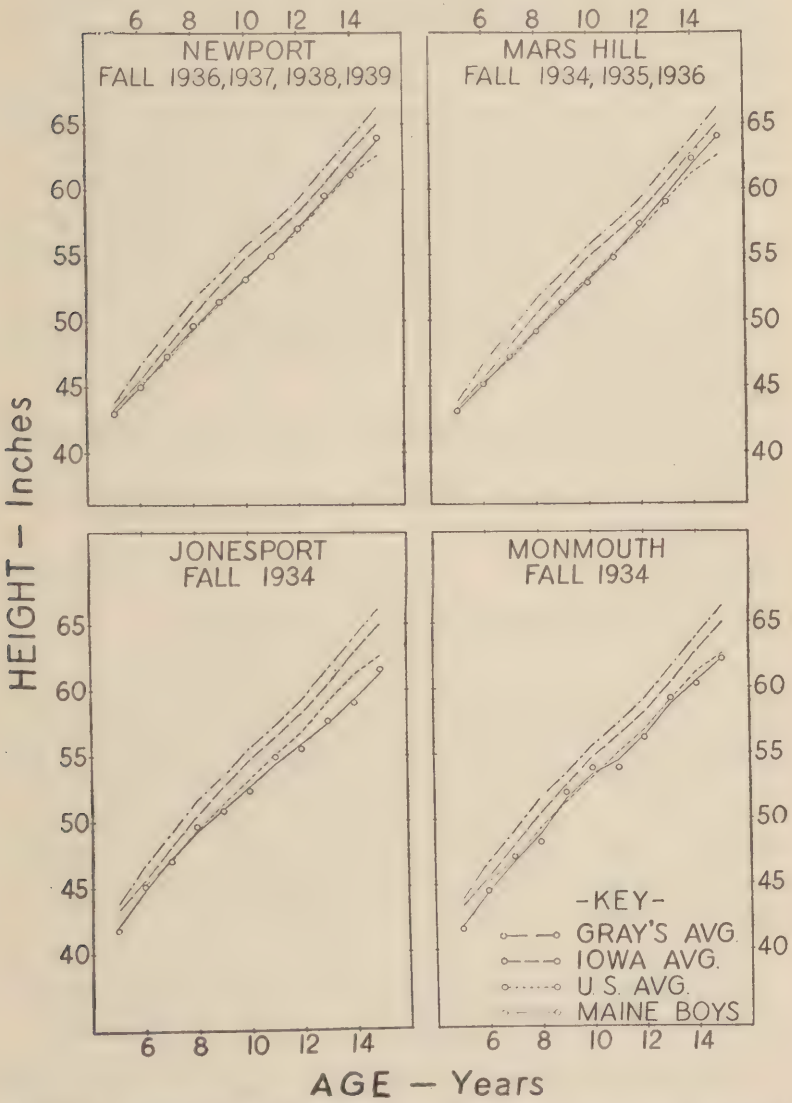

CHART 2. Height of Maine boys. Fall averages for four towns compared with U. S., Iowa, and Gray's averages. (See Table 10, Appendix.)

as the spring averages for the boys in the different years but these differences were not significant.

FALL HEIGHT AVERAGES FOR EACH OF THE FOUR TOWNS COMPARED WITH EACH OTHER

(Girls) Chart 1 and Table 9 (Appendix) show that the Newport four-year averages for the girls tended to be somewhat higher than those for the other three towns. The differences between the Newport and Jonesport averages were highly significant.

(Boys) As shown in Chart 2 and Table 10 (Appendix), the Newport four-year averages and the Mars Hill three-year averages for the boys were very similar. However, when the Newport and Mars Hill averages were each compared with those for Jonesport and Monmouth the differences had the following statistical significance:

Newport and Jonesport: Newport averages higher. Differences highly significant.
Mars Hill and Jonesport: Mars Hill averages higher. Differences significant.
Newport and Monmouth: Newport averages higher. Differences significant.
Mars Hill and Monmouth: No significant difference.

The highly significant differences in average height of the Newport and Jonesport children may be associated with differences in food supply in the two towns. Jonesport is located on the seacoast, off the main highway, and, especially during the winter months, less food is probably shipped into that town than into Newport. Also fewer Jonesport families have home gardens and the average family incomes are probably somewhat lower and more irregular than those in Newport.

FALL HEIGHT AVERAGES FOR EACH OF THE FOUR TOWNS COMPARED WITH THE U. S., IOWA, AND GRAY'S AVERAGES

(Girls) See Chart 1 and Table 9 (Appendix). The fall averages for the Newport and Monmouth (except ages 8, 11 and 13) girls were similar to the U. S. averages; those for Mars

Hill and Jonesport, however, were lower and the differences were highly significant. The averages for the girls in each of the four towns were considerably lower than the Iowa City averages of Boynton (1936) and those of Gray and Ayres (1931) for private school girls. Moreover, the differences were highly significant. When the results for the girls in all four towns were averaged together and compared with the U. S., Iowa, and Gray's averages the differences were highly significant.

(Boys) See Chart 2 and Table 10 (Appendix). The fall averages for the Newport, Mars Hill, and Monmouth boys were similar to the U. S. averages. Those for Jonesport, however, were lower and the differences were significant. The averages for the boys in each of the four towns were considerably lower than those of Meredith (1935) for Iowa City boys and those of Gray and Ayres (1931) for private school boys. Again, the differences were highly significant. When the results for the boys in all four towns were averaged together and compared with the U. S., Iowa, and Gray's averages the differences were not significant for the U. S. averages but were highly significant for the other two.

TABLE 11

Average Weights of Mars Hill, Maine Girls

Fall age†	1934–1935				1935–1936				1936–1937			
	Number		Average		Number		Average		Number		Average	
	Fall	Spring*	Fall	Spring*	Fall	Spring*	Fall	Spring*	Fall	Spring*	Fall	Spring*
			lb.	lb.			lb.	lb.			lb.	lb.
5	5	5	41.5	42.6	5	4	37.1	39.3	3	3	40.1	41.6
6	12	11	42.7	44.9	11	12	43.3	46.7	8	9	45.3	45.8
7	18	18	44.4	46.1	12	11	48.7	51.8	15	14	45.5	47.4
8	17	17	52.2	54.9	19	17	50.2	51.1	15	16	54.2	56.3
9	13	11	56.2	58.7	18	17	58.5	61.2	19	19	54.9	57.9
10	11	11	66.7	69.3	11	11	63.9	67.8	16	16	65.6	67.8
11	18	18	73.0	76.9	15	15	73.3	78.2	18	16	68.1	71.7
12	14	13	78.4	84.2	14	13	84.7	90.2	16	16	86.9	92.1
13	13	13	88.7	93.6	7	6	95.7	102.0	12	12	94.1	97.3
14	5	5	96.8	102.1	5	5	102.2	105.3	9	7	90.3	89.0
15	—	—	—	—	1	1	125.3	126.0	3	2	116.5	119.3

† To nearest birthday.

* Spring and fall age groups kept the same.

TABLE 12

Average Weights of Mars Hill, Maine Boys

Fall age†	1934–1935				1935–1936				1936–1937			
	Number		Average		Number		Average		Number		Average	
	Fall	Spring*	Fall	Spring*	Fall	Spring*	Fall	Spring*	Fall	Spring*	Fall	Spring*
			lb.	lb.			lb.	lb.			lb.	lb.
5	5	5	39.9	40.9	1	1	42.3	44.0	2	2	40.1	41.3
6	9	9	45.3	47.0	12	11	46.4	47.4	6	6	44.2	46.4
7	7	7	47.0	50.1	7	5	48.8	52.1	17	15	50.1	52.9
8	15	13	51.4	53.8	14	13	53.8	57.2	8	8	52.0	54.4
9	9	9	56.4	58.6	12	11	58.6	60.2	14	14	60.7	61.8
10	15	14	63.3	65.8	11	10	64.4	67.0	13	12	62.2	63.7
11	6	6	66.0	67.8	11	11	66.6	69.7	12	12	67.7	70.4
12	8	8	80.4	83.4	6	4	77.1	76.7	15	15	75.7	78.6
13	10	9	87.3	94.4	6	5	82.1	87.4	5	5	79.7	85.0
14	2	2	90.9	98.6	5	4	94.8	103.2	8	4	97.3	104.5
15	1	1	97.8	103.1	1	1	112.3	122.2	5	4	102.5	111.6

† To nearest birthday.
* Spring and fall age groups kept the same.

Summary for height. The above results would seem to indicate that, in general, the Mars Hill and Jonesport girls and the Jonesport boys measured in this study tended to be somewhat shorter than public school children in other parts of the U. S. The groups measured in all four towns were significantly shorter than the more highly selected groups studied by Meredith and Boynton and Gray and Ayres.

WEIGHT

Annual Differences in Mars Hill Weight Averages (1934-37)

(Girls) As shown in Table 11 there was a tendency for the average fall and spring weights of the Mars Hill girls to be slightly higher in 1935-36 than in the other two years. However, the differences were not significant.

(Boys) Table 12 shows that in general, the fall as well as the spring averages for the boys were about the same in each of the three years.

TABLE 13

Average Weights of Newport, Maine Girls

Fall age†	1936–1937				1937–1938				1938–1939				1939–1940			
	Number		Average		Number		Average		Number		Average		Number		Average	
	Fall	Spring*	Fall	Spring*	Fall	Spring*	Fall	Spring*	Fall	Spring*	Fall	Spring*	Fall	Spring*	Fall	Spring*
			lb.	lb.			lb.	lb.			lb.	lb.			lb.	lb.
5	7	6	37.6	41.0	8	8	39.4	42.0	7	4	35.6	39.1	5	4	39.3	40.1
6	17	17	40.5	43.5	13	11	40.8	44.5	14	9	41.9	46.9	13	12	39.8	42.0
7	10	10	46.5	48.5	20	20	44.4	47.1	13	11	46.8	50.5	14	12	45.4	48.0
8	14	12	49.3	51.9	9	9	49.4	53.3	17	16	48.9	52.3	14	13	50.9	54.5
9	20	19	58.1	59.9	14	14	55.1	59.4	11	11	54.4	57.5	17	16	55.0	59.4
10	10	9	59.8	63.4	18	17	59.3	67.9	16	15	63.0	68.3	9	9	59.8	63.1
11	12	12	73.0	76.7	13	13	68.5	74.9	13	11	72.0	77.3	15	15	71.1	76.4
12	19	18	79.9	87.9	11	10	79.4	86.7	15	12	82.5	89.4	12	11	83.4	90.0
13	8	8	91.3	96.1	14	14	92.7	99.2	11	8	93.3	105.5	9	7	95.1	96.2
14	3	3	101.7	108.9	4	4	93.2	99.2	7	6	98.1	104.7	5	4	107.2	111.1
15	2	2	91.0	94.2	3	2	103.4	114.1	2	2	99.3	106.7	3	2	95.6	100.4

† To nearest birthday

* Spring and fall age groups kept the same.

TABLE 14

Average Weights of Newport, Maine Boys

Fall age†	1936–1937				1937–1938				1938–1939				1939–1940			
	Number		Average		Number		Average		Number		Average		Number		Average	
	Fall	Spring*	Fall	Spring*	Fall	Spring*	Fall	Spring*	Fall	Spring*	Fall	Spring*	Fall	Spring*	Fall	Spring*
			lb.	lb.			lb.	lb.			lb.	lb.			lb.	lb.
5	2	2	38.2	42.3	1	1	41.3	45.5	6	2	40.9	39.3	7	6	40.4	42.5
6	14	13	44.2	47.2	10	9	45.7	48.3	8	8	43.2	45.7	16	15	45.3	47.5
7	9	9	50.8	53.5	15	13	50.5	53.5	11	8	49.7	53.4	11	11	48.6	51.8
8	16	14	51.1	52.3	9	7	57.3	61.9	15	14	56.3	59.9	10	9	55.5	58.5
9	17	17	57.5	68.1	13	12	54.9	58.7	8	8	63.5	67.7	13	11	62.4	67.8
10	11	11	65.3	68.3	21	20	65.9	68.8	12	11	60.6	64.0	9	9	68.8	73.3
11	24	23	70.9	74.3	8	5	68.5	73.0	17	17	71.7	75.1	13	13	67.0	71.6
12	17	17	77.4	80.2	24	21	78.2	85.8	5	5	76.8	82.4	18	18	78.3	83.6
13	5	5	90.2	97.2	14	14	83.1	88.7	19	18	91.4	99.0	8	7	92.6	98.6
14	9	8	99.0	104.1	5	5	93.0	102.0	5	4	83.4	87.9	9	7	104.6	112.4
15	2	2	121.9	127.0	3	3	96.8	105.8	4	3	104.5	115.5	1	1	101.2	105.1

† To nearest birthday.

* Spring and fall age groups kept the same.

Annual Differences in Newport Weight Averages (1936-40)

(Girls) A comparison of the average fall weights for the girls in the different years shows that, except for fall 1939, the averages for the different years were quite similar. Those for fall 1939 tended especially to be higher than those for fall 1937. (See Table 13.) Moreover, the differences were significant. The spring averages in the different years showed no significant differences, but the averages for spring 1939 tended to be slightly higher than those for the other years.

(Boys) From Table 14 it will be seen that there was some tendency for the average weights of the boys to be lower in fall 1938 and higher in fall 1939 than in the other years. However, the differences between the fall averages were not significant. There were also no significant differences between the spring averages, although those for spring 1940 tended to be slightly higher than those for the other years.

Fall Weight Averages for Each of the Four Towns Compared With Each Other

(Girls) As shown in Chart 3 and Table 15 (Appendix), the four-year weight averages for the Newport girls were about the same as the three-year averages for Mars Hill, slightly higher than those for Jonesport, and slightly lower than those for Monmouth. However, the differences between the Newport averages and those for the other three towns were not significant. The averages for the Mars Hill and Monmouth girls were significantly higher than those for the Jonesport girls.

(Boys) Chart 4 and Table 16 (Appendix) show that the four-year weight averages for the Newport boys were about the same as those for the Monmouth boys and somewhat higher than those for Jonesport and Mars Hill. However, only the differences between the Newport and Mars Hill averages were significant. The differences between the Mars Hill, Jonesport, and Monmouth averages were not significant.

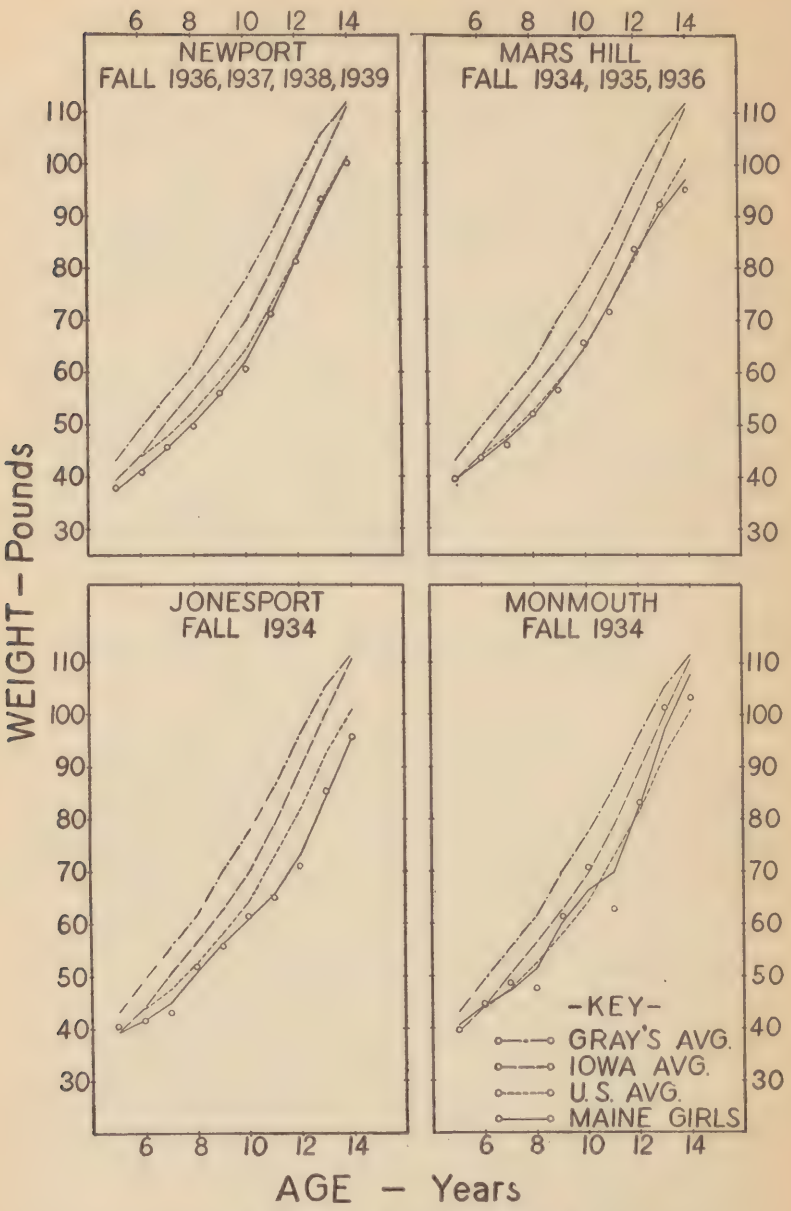

CHART 3. Weight of Maine girls. Fall averages for four towns compared with U. S., Iowa, and Gray's averages. (See Table 15, Appendix.)

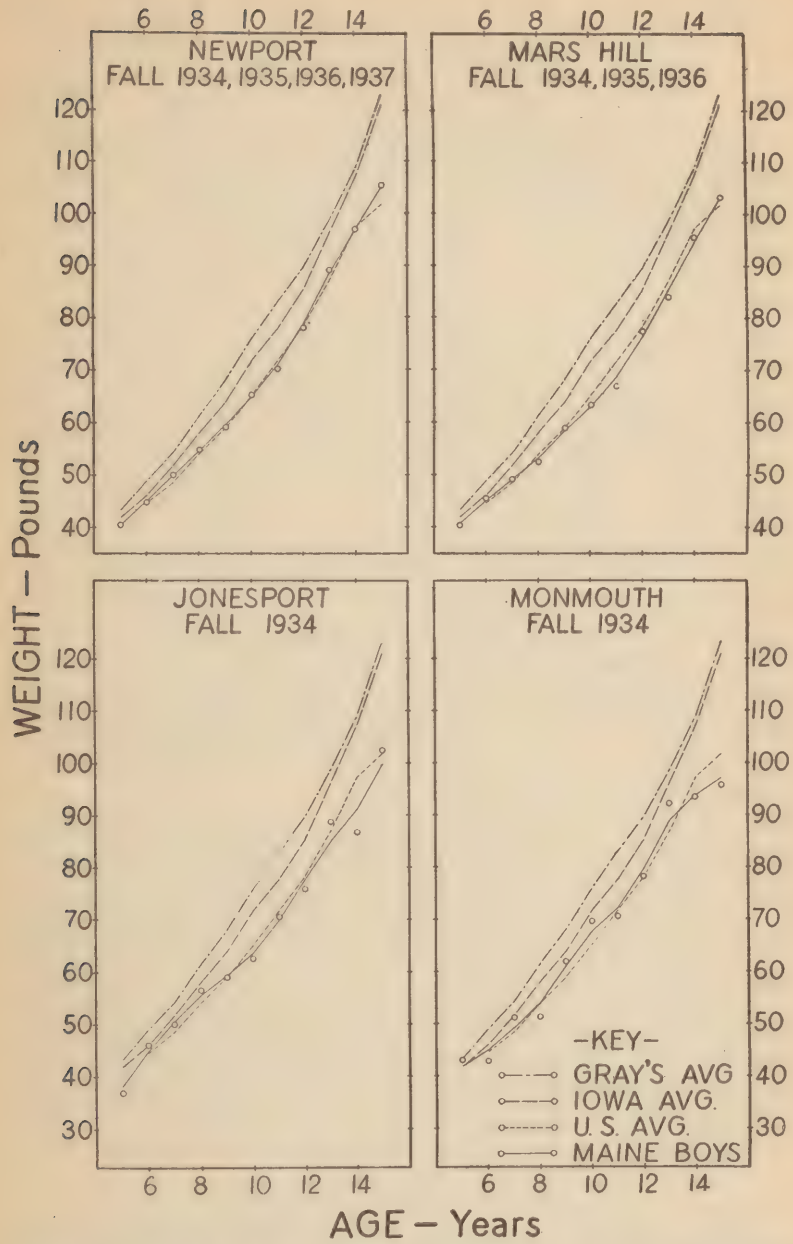

CHART 4. Weight of Maine boys. Fall averages for four towns compared with U. S., Iowa, and Gray's averages. (See Table 16, Appendix.)

FALL WEIGHT AVERAGES FOR EACH OF THE FOUR TOWNS COMPARED WITH THE U. S., IOWA, AND GRAY'S AVERAGES

(Girls) See Chart 3 and Table 15 (Appendix). The fall averages for the Mars Hill and Monmouth girls were very similar to the U. S. averages; those for Newport and Jonesport, however, were lower and the differences were highly significant. The averages for the girls in each of the four towns were considerably lower than the Iowa and Gray's averages and the differences were highly significant. When the results for the girls in all four towns were averaged together and compared with the U. S., Iowa, and Gray's averages the differences between the Maine and U. S. averages were significant. In comparison with the Iowa and Gray's averages the differences were highly significant.

(Boys) See Chart 4 and Table 16 (Appendix). The fall averages for the boys in each of the four towns showed no significant differences from the U. S. averages. In comparison with the Iowa and Gray's averages, however, those for Maine boys were considerably lower. The differences were highly significant (except in the comparison between the Monmouth and Iowa averages; in this case the differences were significant). When the results for the boys in all four towns were averaged together and compared with the U. S., Iowa, and Gray's averages the differences showed no significance in the case of the U. S. averages but high significance for the Iowa and Gray's.

Summary for weight. The above results can be summarized briefly as follows: The Newport and Jonesport girls measured in this study tended to weigh less than public school girls in other parts of the U. S. (Collins and Clark, 1929). The average weights of the boys in all four Maine towns were about the same as the U. S. averages. In comparison with the Iowa City averages of Meredith (1935) and Boynton (1936) and the averages of Gray and Ayres (1931) for private school children, the average weights of the Maine girls and boys in this study were significantly low.

TYPE OF BUILD

In Newport (1936-40) and in Mars Hill (1936-37) the necessary measurements were taken for determining normal weight by the McCloy method and the McCloy weight, fat, and limb girth

indices (McCloy 1936, 1938). See p. 115 and Form 1, Appendix. Therefore these individual measurements were available for comparison with those of other groups of children.

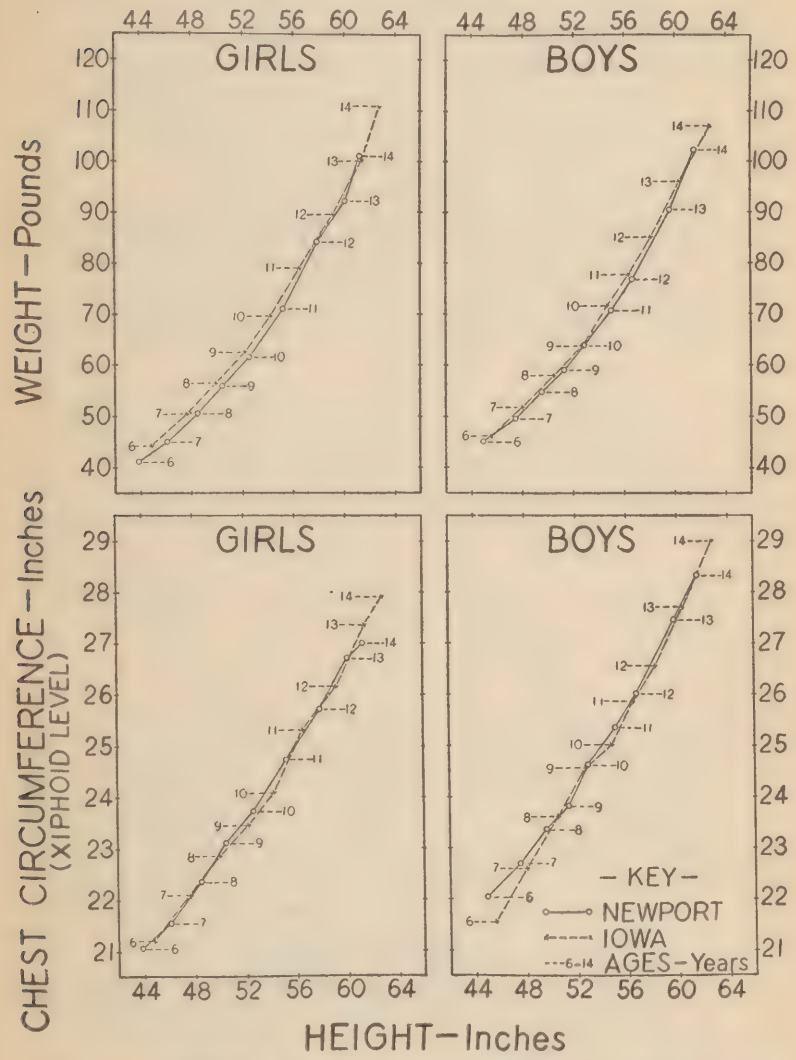

CHART 5. Comparison of Newport, Maine, children with Iowa City children. Height for weight and height for chest circumference (xiphoid level). (See Table 17, Appendix.)

As a method for studying the average type of build of the Newport children their average height for age and sex was considered in relationship to average weight, average chest circumference (xiphoid level), and average bi-iliac hip width. In Charts 5 and 6 curves are given which make it possible to compare the average build of the Newport children with that of the Iowa City children studied by Meredith (1935) and Boynton (1936). Since two sets of measurements were made on the Newport group each year, those measurements were used (in this study of build) which fell nearest to the child's birthday.

Height for weight. From Chart 5[12] it will be seen that if age is not considered, the average weight for a given height of the Newport children is not far below that of the Iowa children. However, when age also is considered the Newport children are found to be retarded, as much as one year in some age groups.

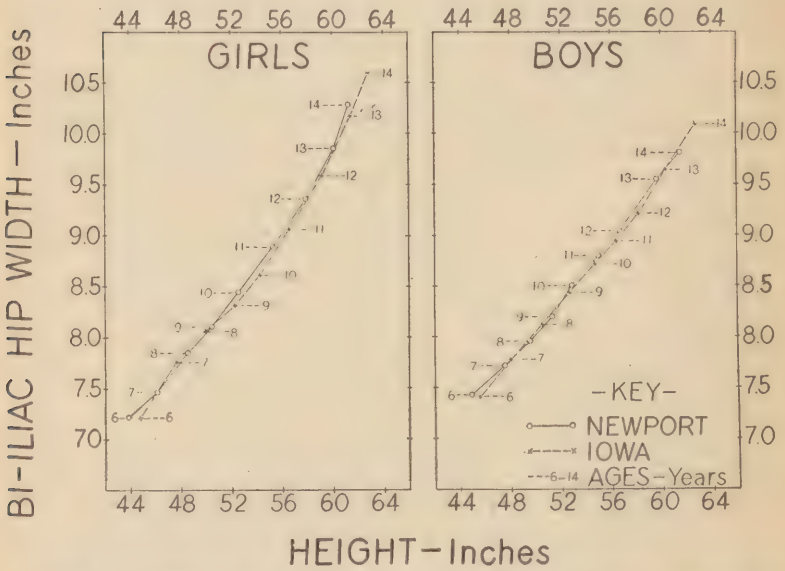

CHART 6. Comparison of Newport, Maine, children with Iowa City children. Height for bi-iliac hip width. (See Table 17, Appendix.)

[12] The Newport averages for height, weight, chest circumference (xiphoid level), and bi-iliac hip width used in charts 5 and 6 are given in Table 17 (Appendix).

Height for chest circumference (xiphoid level). Chart 5[12] shows that the Newport and Iowa curves of height for chest circumference are practically superimposed, except in the two lower age groups of the boys. This indicates that the Maine and Iowa children are proportioned about the same. A study of the size-for-age relationship shows, however, that the Newport children are both shorter in stature and smaller in chest circumference for their age than the Iowa children.

Height for bi-iliac hip width. Chart 6[12] shows again that the Newport children are proportioned about the same as the Iowa City children. When age is considered, however, the Newport children are both shorter in stature and narrower in the hips than the Iowa City children.

The question arises as to what the causes may be for this difference in size for age of the Newport and Iowa City children. Some of the difference may be due to inheritance but it is also probable that many of the diets of the Newport children were deficient in one or more of the necessary growth factors. Among these may be mentioned the following: high quality protein, calcium (together with phosphorus and vitamin D), vitamin A, thiamin, riboflavin, niacin, and vitamin C.

EVALUATION OF THE McCLOY METHOD FOR DETERMINING NORMAL WEIGHT AND THE McCLOY WEIGHT, FAT, AND LIMB GIRTH INDICES

The measurements taken for determining normal weight by the McCloy method and the McCloy (1936, 1938) weight, fat, and limb girth indices[13] included the following: standing height, weight, chest circumference (xiphoid level), girth of upper arm, girth of forearm, girth of thigh, girth of calf, bi-iliac hip width, elbow width, knee width, fat-chest front, fat-abdomen, fat-chest back, and fat-supra-iliac.

[13] The formulas for these indices are as follows:

Weight index: $\frac{\text{Actual weight}}{\text{Normal weight}} \times 100$

Fat index: $\frac{\text{Actual fat}}{\text{Normal fat}} \times 100$ or $\frac{\text{Actual fat minus normal fat}}{\text{Normal minus minimum}} \times 100$

Limb girth index: $\frac{\text{Actual limb girth}}{\text{Normal limb girth}} \times 100$

Relationship between the McCloy indices and the writer's estimates of nutrition. The results of the above measurements, made on the Newport children, were used by the writer (Clayton, 1942) to study the relationship between the McCloy weight, fat, and limb girth indices and her own estimates of nutrition. High correlations were obtained between the weight and fat indices and the nutrition estimates but the correlation between the limb girth indices and the estimates of nutrition was low.

Adequacy of the McCloy weight standards for individual children. In the same study an attempt was made to evaluate the McCloy weight standards for individual children of varying skeletal builds and varying states of nutrition. For children having other than average skeletal builds the McCloy standards seemed to be much more adequate than the Baldwin-Wood, which are based on age and height only. The McCloy standards appeared to be somewhat high, however, for overweight subjects and somewhat low for those who were extremely underweight. The conclusion was reached that, in spite of these inadequacies, the McCloy standards for normal weight are apparently more reliable than any others available at present. However, since it is necessary to take 8 (9, including actual weight) physical measurements in order to determine a child's normal weight by this method, the time and labor involved in taking the measurements and in making the necessary calculations must be considered in any plan for using the method.

Value of the McCloy weight and fat indices in judging nutritional status. These indices provide information which can be used to determine not only whether a child weighs the correct amount for his skeletal build but also whether or not he has a normal distribution of muscle and fat.

Use of normal weight to determine build type. As suggested by McCloy (1938, p. 13) a child's normal weight, determined by the McCloy method, may be used to determine his type of body build by the use of the following formula:

$$\sqrt[3]{\frac{\text{Normal wt. in kg. x } 100}{\text{Ht. in cm.}}}$$

This so-called "ponderal index" was used to study the body build of the group of 24 Newport boys who were 11 years old (nearest birthday) at the time of the 1936 fall examination. The

average index for the group was 2.27 with a standard deviation of ±.05. This average is the same as the one given by McCloy for Iowa boys of this age. This again indicates that, in general, the Newport and Iowa boys, aged 11 years, have skeletal builds which are proportioned about the same. However, a comparison of the average height, chest circumference (xiphoid level), and the bi-iliac hip width of this 11-year-old group of Newport boys with the Iowa averages for boys of the same age given by Boynton (1936, pp. 83 and 84), shows that the Newport boys are somewhat smaller for their age:

Boys Age 11	Av. height inches	Stand. dev.	Av. bi-iliac hip width inches	Stand. dev.	Av. chest cir. (xiphoid level) inches	Stand. dev.
Iowa	56.4	±2.40	8.94	±.54	25.86	±1.56
Newport	55.3	±1.91	8.74	±.37	25.10	±1.01

Use of normal weight to determine developmental progress. Since a child's developmental progress is even more important than his weight for skeletal build at any particular time, a curve showing his height and calculated (by the McCloy method) normal weight at successive ages could be compared with a height-weight curve for well-nourished children, such as the one given in Chart 5 for Iowa City children. Since normal weight, as determined by the McCloy method, is based on skeletal build this comparison would give an indication of his progress in skeletal development.

PHYSICAL CHANGES DURING ADOLESCENCE

Since the Newport children were examined in four successive years, it has been possible to study the physical changes which took place in a group of 12 girls and 7 boys during the period of adolescence. These changes have been summarized in Tables 18 and 19. All of the girls who were 9 and all of the boys who were 11 years old at the beginning of the study were included. The stage of pubescence which had apparently been reached at the time of each fall physical examination has been indicated in the Tables as follows: 0 (no development) to 3+ (mature).

TABLE 18

Physical Changes in Newport Girls during Adolescence

	Fall 1936					Fall 1937					Fall 1938					Fall 1939				
Ages	9					10					11					12				
Case No.	Ht. in.	Bi-iliac hip width in.	Wt.* index	Pon-deral† index	Stage of pubes-cence	Ht. in-crease from age 9 %	Hip width in-crease from age 9 %	Wt.* index	Pon-deral† index	Stage of pubes-cence	Ht. in-crease from age 9 %	Hip width in-crease from age 9 %	Wt.* index	Pon-deral† index	Stage of pubes-cence	Ht. in-crease from age 9 %	Hip width in-crease from age 9 %	Wt.* index	Pon-deral† index	Stage of pubes-cence
1	46.8	7.36	100	2.36	0	3.5	5.9	94	2.38	0	7.5	9.6	96	2.36	0 to +	12.0	15.5	93	2.35	+
2	49.4	7.72	90	2.30	0	3.3	4.1	86	2.32	0	8.3	9.7	86	2.29	0	14.2	16.8	89	2.28	0
3	50.0	8.07	101	2.36	0	5.0	10.2	90	2.43	+	12.0	18.0	100	2.38	2+	16.0	22.9	99	2.37	3+
4	50.8	8.07	92	2.32	0	3.7	6.3	89	2.34	0	9.1	11.7	87	2.31	0 to +	15.8	18.5	86	2.31	+ to 2+
5	51.5	8.39	110	2.34	0	5.6	6.6	96	2.36	0	11.9	12.2	100	2.29	+ to 2+	16.0	17.4	101	2.26	3+
6	51.9	8.50	108	2.35	0	4.8	5.6	102	2.39	0 to +	10.4	12.5	105	2.40	2+	14.7	24.0	101	2.42	2+
7	51.9	8.27	105	2.30	0	6.0	5.2	97	2.34	+	12.0	14.8	101	2.30	2+	15.7	18.6	102	2.28	3+
8	52.0	8.27	99	2.28	0	4.3	5.7	99	2.30	0	10.8	12.9	102	2.27	+	17.1	18.6	103	2.24	2+
9	52.0	7.83	94	2.45	0	1.0	8.5	100	2.45	0	5.3	13.6	100	2.45	0	10.3	19.1	101	2.40	0 to +
10	52.9	8.78	82	2.34	0	3.8	4.9	82	2.34	0	7.8	8.1	77	2.35	0	12.3	12.6	81	2.33	0 to +
11	53.0	8.90	107	2.29	0	4.0	4.4	98	2.36	0	7.5	9.3	104	2.32	+	10.4	11.5	103	2.32	+
12	54.3	8.39	106	2.15	0	3.0	6.1	95	2.24	0	6.2	8.5	96	2.23	0	10.6	13.6	95	2.22	0
Av.	51.4	8.21	100	2.32		4.0	6.1	94	2.35		9.1	11.7	96	2.33		13.8	17.4	96	2.32	

* $\frac{\text{Actual weight} \times 100}{\text{Normal weight (McCloy 1936, 1938)}}$

An index below 94 indicates underweight.
An index of 108 or above indicates overweight.

† $\frac{\text{Normal weight (McCloy) x 100 in kg}}{\sqrt[3]{\text{Ht. in cm.}}}$

This in an index of type of skeletal build.
A low index indicates a slender type, a high index a stocky type.

TABLE 19

Physical Changes in Newport Boys during Adolescence

	Fall 1936					Fall 1937					Fall 1938					Fall 1939				
Ages	11					12					13					14				
	Ht.	Bi-iliac hip width	Wt.* index	Ponderal† index	Stage of pubescence	Ht. increase from age 11	Hip width increase from age 11	Wt.* index	Ponderal† index	Stage of pubescence	Ht. increase from age 11	Hip width increase from age 11	Wt.* index	Ponderal† index	Stage of pubescence	Ht. increase from age 11	Hip width increase from age 11	Wt.* index	Ponderal† index	Stage of pubescence
Case No.	in.	in.				%	%				%	%				%	%			
1	52.3	7.99	101	2.31	0	2.4	4.9	99	2.33	0	4.8	7.4	101	2.31	0	6.9	8.4	101	2.25	0
2	53.0	8.27	101	2.29	0	3.3	6.7	96	2.33	0	7.5	11.9	100	2.33	0	12.7	14.3	100	2.29	0
3	53.3	8.78	103	2.39	0	4.7	4.5	100	2.39	0	9.6	10.3	101	2.39	2+	15.5	12.1	100	2.36	3+
4	54.0	8.94	106	2.31	0	2.8	—	104	2.40	0	7.9	11.5	105	2.41	+	16.0	15.9	110	2.38	3+
5	54.8	8.19	90	2.31	0	2.7	4.3	92	2.29	0	5.9	7.2	94	2.28	0	10.0	11.1	95	2.27	0
6	55.8	9.29	101	2.29	0	3.4	4.7	95	2.33	0	8.5	8.9	96	2.30	+	15.0	14.4	94	2.34	3+
7	57.9	8.78	100	2.24	0	8.0	8.1	93	2.29	+	14.3	14.8	101	2.26	3+	18.1	17.9	102	2.26	3+
Av.	54.4	8.61	100	2.31		3.9	4.6	97	2.34		8.4	10.3	100	2.33		13.5	13.4	100	2.31	

* Actual weight x 100 / Normal weight (McCloy 1936, 1938)

An index below 94 indicates underweight.
An index of 108 or above indicates overweight.

† $\sqrt[3]{\frac{\text{Normal weight (McCloy) x 100 in kg}}{\text{Ht. in cm.}}}$

See McCloy, 1938, p. 13.

This in an index of type of skeletal build.
A low index indicates a slender type, a high index a stocky type.

The rating of stage of pubescence was based on the following physical changes (Adapted from McCloy, 1938, p. 90):

	GIRLS	BOYS
+	Beginning pubescence. Slight development of breasts. A few pigmented pubic hairs.	Begining pubescence. Beginning acceleration in development of genitalia. A few pigmented pubic hairs.
++	Intermediate stage in development of breasts and growth of pigmented pubic hair.	Intermediate stage in development of genitalia and growth of pigmented pubic hair.
+++	Probable sexual maturity. Breasts developed. Menstruation has begun. Full growth of pigmented pubic hair.	Probable sexual maturity. Genitalia developed. Full growth of pigmented pubic hair.

Girls. As shown in Table 18, only 3 of the 12 girls in the group showed signs of beginning pubescence at age 10. At age 12 three were mature, 2 did not even show signs of beginning pubescence, and the other 7 were in intermediate stages. The attainment of maturity was accomplished by a gain in height of about 16 per cent from age 9. The percentage increase in hip width from age 9 did not appear to be related to the attainment of maturity.

Boys. As shown in Table 19, there was 1 boy in the group of 7 who was unusually far advanced in physical development for his age. He was the tallest of the group and showed evidence of beginning pubescence at age 12. At age 13 he showed signs of maturity and had gained 14.3 per cent in height from age 11. During the next year he gained 18.1 per cent (from age 11). The 4 boys who matured during the period of this study were among the tallest in the group (See McCloy, 1938, p. 91) and attainment of maturity was accompanied by an increase in height of about 16 per cent from age 11. The percentage increase in hip width did not appear to be related to the attainment of maturity.

DENTAL EXAMINATIONS

As was previously stated, Miss Dorothy Bryant, D.H., Associate Director, Division of Dental Health, State Department of Health and Welfare, made all of the examinations of the teeth in

the Newport study. The examinations were made in the fall of each year. Miss Bryant also made the gum examinations in the fall of 1936, fall of 1937 and spring of 1938. Beginning with the fall of 1938 gum examinations were made, both fall and spring, by Dr. Philip W. Woods, Director, Division of Dental Health, State Department of Health and Welfare. Dr. Woods also examined the gums of special groups of children in connection with six-hour saturation tests for vitamin C deficiency and vitamin C tests for the cure of inflamed gums.

Method of Examination

Form 2 (Appendix) was used for recording the Newport examinations. No prophylaxis preceded them, since facilities did not permit. The child was seated facing the light and each of the five tooth surfaces was searched carefully with S.S. White explorers (No. 3 double end and No. 5) together with plain mirrors. All sound teeth present in the mouth were indicated on the card by check marks. Those having defects were described individually by the use of the symbols given in Form 2. When necessary, notes were made regarding special conditions found. Missing teeth were not recorded specifically as such, but teeth known to have been extracted were so indicated.

Cavities were classified as follows and the involved tooth surfaces indicated on the cards:

1. Superficial. Cavities in which the caries penetrated the enamel surface but not beyond. The following were included under superficial cavities but were recorded separately.

   Decalcified areas. White areas of decalcification following the gingival margin on the buccal or lingual surface. Such an area was recorded if present, whether or not the explorer penetrated the enamel.

   Fissures (and pits). Slight defects in the enamel surface in which the explorer caught. Such defects are considered precarious or predisposed to caries.

2. Deep. Cavities in which the caries involved the dentine only or both dentine and pulp. The following were included under deep cavities but were recorded separately:

Retarded caries. A condition seen in teeth in which decay has progressed into the dentine, where it is halted by some metabolic process. The exposed surface of dentine becomes hard and appears dark in color.
Retained roots. Remains of teeth in which the crowns have been destroyed by caries as far as the gum line.

Fillings were classified only as deciduous or permanent according to their location. However, the tooth surfaces involved were indicated on the cards.

RESULTS OF DENTAL EXAMINATIONS

A summary of the results of the Newport examinations is given in Table 20. In this table cavities in both the deciduous and permanent teeth are classified only as superficial and deep and are calculated as an average per mouth examined. In Table 21 the fall 1936 results for Newport are compared with the fall 1934 results for the other three towns. In this table decalcified areas and fissures are indicated separately so that comparisons may be made with results of other surveys in which these defects were not included as superficial cavities. The omission of these in the present study would reduce especially the figures for total cavities in the permanent teeth.

Following is an explanation of the terms used in summarizing the results:

"Combined total cavities" is an average per mouth examined, including both deciduous and permanent teeth.

"Combined total fillings" is an average per mouth examined, including both deciduous and permanent teeth.

"Affected teeth" are calculated as an average per mouth examined of all teeth present which have been affected by caries, whether active or corrected. Retained roots are included.

"Extracted permanent teeth carious" is an average per mouth examined. Only extractions of carious permanent teeth are included, since it was difficult to distinguish between exfoliated and extracted deciduous teeth.

"No caries" is recorded as the percentage of children with no caries, fillings, or extractions.

TABLE 20

Summary of Newport Dental Examinations

Year		No. in group	Av. no. cavities deciduous teeth			Av. no. cavities permanent teeth			Av. no. comb. total cavities	Av. no. fillings			Av. no. affected teeth†	Av. no. deciduous teeth abscessed	Av. no. permanent teeth abscessed	Av. no. extracted permanent teeth carious	No caries	Malocclusion	Hypoplastic enamel	Inflamed gums	
			S*	D	Total	S*	D	Total		Deciduous	Permanent	Comb. total								Fall	Spring
																	%	%	%	%	%
	Girls	116	.7	4.3	4.9	2.1	2.3	4.4	9.3	.60	1.07	1.67	7.8	.22	.02	.18	3.5	37.9	2.6	8.6	—
1936–37	Boys	126	.9	4.3	5.1	2.3	2.8	5.1	10.2	.06	1.13	1.19	7.9	.19	.07	.16	3.2	46.8	3.2	13.5	—
	Total	242	.8	4.3	5.0	2.2	2.6	4.8	9.8	.32	1.10	1.42	7.9	.20	.05	.17	3.3	42.6	2.9	11.2	—
	Girls	124	.8	4.1	4.8	1.9	2.2	4.2	9.0	.55	1.19	1.73	7.5	.27	.02	.23	2.4	29.0	.8	7.3	29.4
1937–38	Boys	119	.5	4.1	4.6	1.7	3.0	4.7	9.3	.23	1.32	1.55	7.7	.12	.07	.19	3.4	40.3	4.2	6.7	37.4
	Total	243	.7	4.1	4.7	1.8	2.6	4.4	9.1	.39	1.25	1.64	7.6	.20	.04	.21	2.9	34.6	2.5	7.0	33.3
	Girls	133	1.0	3.8	4.8	2.5	2.5	5.0	9.8	.65	1.47	2.12	8.0	.21	.02	.18	1.5	—	3.0	17.3	21.2
1938–39	Boys	118	1.0	4.7	5.6	2.1	3.4	5.5	11.1	.30	1.33	1.63	8.4	.15	.04	.20	3.4	—	1.7	17.8	20.9
	Total	251	1.0	4.2	5.2	2.3	2.9	5.2	10.4	.49	1.40	1.89	8.2	.18	.03	.19	2.4	—	2.4	17.5	21.0
	Girls	125	.3	4.4	4.8	.9	3.7	4.7	9.4	.53	1.54	2.06	7.9	.21	.01	.12	6.4	—	2.6	8.8	15.7
1939–40	Boys	117	.3	5.4	5.7	1.1	3.5	4.6	10.3	.40	1.19	1.59	7.9	.13	.01	.23	5.1	—	3.4	12.8	22.4
	Total	242	.3	4.9	5.2	1.0	3.6	4.6	9.8	.47	1.37	1.83	7.9	.17	.01	.17	5.8	—	3.0	10.7	18.9
																		2 yrs.			3 yrs.
4 years	Total	978	.7	4.4	5.0	1.9	2.9	4.8	9.8	.42	1.28	1.70	7.9	.19	.03	.19	3.6	38.6	2.7	11.7	24.4

* Decalcified areas and fissures included.

† Including retained roots.

Key to abbreviations: S—Superficial
D—Deep

TABLE 21

*Summary of Fall Dental Examinations Made in Four Maine Towns**

Town	Year	No. in group	Average no. cavities deciduous teeth					Average no. cavities permanent teeth					Av. no. combined total cavities	Average no. fillings			Av. no. affected teeth†	Av. no. extracted permanent teeth carious	No caries	Malocclusion	Hypoplastic enamel	Inflamed gums
			DA	FS	S	D	Total	DA	FS	S	D	Total		Deciduous	Permanent	Comb. total			%	%	%	%
Newport	1936	242	.0	.1	.7	4.3	5.0	.1	1.3	.8	2.6	4.8	9.8	.32	1.10	1.42	7.9	.17	3.3	42.6	2.9	11.2
Mars Hill	1934	202	.0	.3	.3	5.2	5.7	.0	2.3	.0	4.5	6.8	12.5	.03	.24	.25	10.5	.26	.5	36.1	3.5	3.5
Jonesport	1934	236	.0	.1	.2	4.8	5.1	.0	2.3	.1	3.0	5.4	10.5	.16	.76	.91	8.9	.30	1.8	39.8	1.7	3.4
Monmouth	1934	199	.0	.2	.0	4.9	5.2	.0	2.7	.0	5.0	7.8	13.3	.05	.79	.83	10.5	.27	1.5	37.7	3.0	1.0

* See Clayton, 1940, pp. 80–81.

† Including retained roots

Key to abbreviations: DA—Decalcified areas
FS—Fissures and pits
S—Superficial
D—Deep

"Malocclusion" is calculated as the percentage of children with any of the types of malocclusion listed in Form 2. Overbite was included under upper protrusion.

"Inflamed gums" are recorded as the percentage of children with any type of gum inflammation.

"Abscessed" deciduous or permanent teeth are an average per mouth examined of visible fistulas resulting from the specific teeth involved.

"Hypoplastic enamel" is calculated as the percentage of children with visible formative enamel defects in either the deciduous or permanent teeth. These defects consist of pits or grooves which run parallel to the gum line.

Comments on the data given in Tables 20 and 21 will be made according to the table headings.

Cavities, deciduous. The average number of cavities in the deciduous teeth of the Newport children (for the four years) was 5 and the variation from year to year was slight. Eighty-eight per cent of these were deep cavities and 3.8 per cent had become abscessed, producing visible fistulas. The fall 1936 total average for Newport was slightly lower than that for Mars Hill but similar to those for Jonesport and Monmouth.

Cavities, permanent. The total average number of cavities in the permanent teeth of the Newport children (for the four years) was 4.8 and 60.4 per cent of these were deep cavities. The average for fall 1938 was slightly higher than those for the other three years. The Newport total average for fall 1936 was somewhat lower than those for the other three towns in 1934 but the differences may have been partly due to differences in standards used by the different examiners.

Combined total cavities. The average number of combined total cavities in the teeth of the Newport children for the four years was 9.8, the average for fall 1938 being slightly higher than those for the other three years. The fall 1936 average for Newport was lower than those for the other three towns in 1934. Again, the differences may have been partly due to the difference in examiners.

Fillings, deciduous. Very few fillings were found in the deciduous teeth, the four-year average for Newport being only .42. However, even the low fall 1936 average for Newport was higher than the 1934 average for the other three towns. This almost complete absence of fillings in the deciduous teeth is apparently the

result of the failure of most parents to realize the importance of preserving these teeth until they are naturally exfoliated. Only in this way can the children's mouths be kept healthy and the developmental spaces held for the permanent teeth.

Fillings, permanent. The average number of fillings in the permanent teeth of the Newport children was also very low in comparison to the average number of cavities. The four-year Newport average was 1.28 and that for fall 1936, 1.10. However, even these low figures are higher[14] than those secured in 1934 in the other towns.

Combined total fillings. The Newport four-year average for combined total fillings was 1.7 as against an average of 9.8 for combined total cavities.

Affected teeth. The four-year average for Newport was 7.9. This same figure was secured in fall 1936 and is slightly lower than those secured in the other three towns in 1934.

Extracted permanent teeth, carious. The teeth most frequently extracted in the Newport children were the six-year molars, the four-year average for all permanent teeth being .19. The fall 1936 average of .17 is slightly lower than the 1934 averages for the other towns.

No caries. More children with no caries, fillings, or extractions were found in Newport than in any of the other three towns, the figure for Newport being highest in fall 1939. The four-year average was 3.6 per cent.

Malocclusion. Complete records for malocclusion were made in Newport only in 1936 and 1937. The average for these two years was 38.6 per cent. The average for fall 1936 was 42.6 per cent, which is slightly higher than the results secured in the other towns. Irregular occlusion was the most common type seen but upper protrusion was also very common. Irregular occlusion results from underdevelopment of the jaws, usually due to early loss or severe decay of the deciduous teeth. Underdevelopment of the jaws may also be hereditary or result from poor bone development. It seems probable that an improvement in calcium metabolism, beginning during prenatal life and continued through adolescence,

[14] One of the dentists in Newport made a practice of putting in numerous small fillings rather than a smaller number of larger ones. This may account for the slightly higher average for Newport as compared with the other towns.

might result in better developed jaws and better teeth in Maine children.

Hypoplastic enamel. According to the four-year average, only 2.7 per cent of the Newport children showed hypoplastic enamel in either their deciduous or permanent teeth. In the fall of 1936 the average was 2.9 per cent, which was similar to the figures secured in Mars Hill and Monmouth. The Jonesport figure was slightly lower. According to McCall (1938), hypoplastic enamel in the deciduous teeth is chargeable to prenatal systemic disturbance. In the six-year molars the disturbance may be either prenatal or postnatal but in the other permanent teeth the condition results after birth. Eliot, Souther, et al (1934) state that the usual type of hypoplastic enamel seen in permanent teeth is definitely associated with rickets in early life, although in some cases the effect of certain severe infectious diseases, such as pneumonia and bronchitis, may be superimposed on the effect of rickets. Brucker (1943) found that teeth (deciduous or permanent) which are visibly hypoplastic are not especially subject to decay. According to McCall (1938), however, caries in hypoplastic permanent teeth is apt to result when the pits and grooves are of such depth as to make self-cleansing and cleansing by the tooth brush difficult. McCall also believes that hypocalcification of the enamel of deciduous teeth makes them more subject to decay. (See Brucker, 1943, p. 116.)

Six-year molars. Since the six-year molars are the first permanent teeth to erupt, and also usually the first to decay, studies of the condition of these teeth have been made on groups of children in various parts of the U. S. and the results used to indicate dental conditions in the particular areas. In a previous study in Maine (Clayton, 1940) 80.3 per cent of the grade-school children in Mars Hill, Jonesport, and Monmouth were found to have one or more of their six-year molars carious, filled, or extracted (pits and fissures not counted). This figure is similar to the one secured by Davies (See Roberts, 1935, p. 11) for a non-dairy section of Massachusetts but is almost twice as high as the one secured by Whitacre (1934) for Texas children. In Table 22 the results are given for the incidence of caries in the six-year molars of the Newport children. The four-year average shows that in 91.2 per cent of the children one or more of these teeth were carious, filled, or extracted. The percentage of children with these teeth affected

TABLE 22

Incidence of Caries in the Six-year Molars of Grade-school Children in Newport, Maine

Year		No. in group with 4 6-year molars erupted	No. in group with 4 6-year molars sound		No. in group with 1 or more 6-year molars carious,* filled, or extracted		Total 6-year molar teeth carious, filled, or extracted	
			No.	%	No.	%	No.	%
Fall 1936	Girls	90	8	8.9	82	91.1	232	64.4
	Boys	105	19	18.1	86	81.9	271	64.5
	Total	195	27	13.9	168	86.2	503	64.5
Fall 1937	Girls	93	3	3.2	90	96.8	288	77.4
	Boys	99	6	6.1	93	93.9	319	80.6
	Total	192	9	4.7	183	95.3	607	79.0
Fall 1938	Girls	105	6	5.7	99	94.3	332	79.1
	Boys	99	3	3.0	96	97.0	322	81.3
	Total	204	9	4.4	195	95.6	654	80.2
Fall 1939	Girls	103	13	12.6	90	87.4	294	71.4
	Boys	91	13	14.3	78	85.7	259	71.2
	Total	194	26	13.4	168	86.6	553	71.3
4 years	Total	785	71	11.3	714	91.2	2317	74.3

* Fissures and pits omitted. Decalcified areas counted.

by caries was lowest in the fall of 1936 and highest in 1938. The Newport results for all four years are somewhat higher than those secured in the other three Maine towns in 1934.

Gums. The gums were examined chiefly to detect any inflammation possibly related to vitamin C deficiency. It is well known, however, that there are a number of other causes for inflammation, such as irregular occlusion, poor oral hygiene, irritation from decayed and broken teeth, and infections.

As shown in Table 20, between fall 1937 and spring 1938 there was a sharp increase in the percentage of Newport children who had inflamed gums. By the following fall (1938) the number of children showing inflammation had decreased about half but the fall figure for 1938 was higher than those for the other three years. Figures for spring 1939 and 1940 were not as high as those for spring 1938 but in each year the spring figures were higher than the fall. Since the inflammation of the gums was shown to be

TABLE 23

Results of Six-hour Vitamin C Saturation Tests as Related to Gum Inflammation
Newport. Fall 1938

Ages	Total No. in age group	Increase in vitamin C excretion less than 50 mg. on 2nd day of test					Increase in vitamin C excretion more than 50 mg. on 2nd day of test					Per cent of age group with low test†	Per cent of age group with abnor. gums	Per cent of age group with both low test and abnor. gums
		Condition of gums					Condition of gums							
		Healthy	General redness	+ to 2+ inflam.	Localized* inflam.	Pale with hyper.	Healthy	General redness	+ to 2+ inflam.	Localized* inflam.	Pale with hyper.			
		No.	No.	No.	No.	No.	No.	No.	No.	No.	No.			
Girls														
7–11	19	3	0	1	2	2	8	0	3	0	0	42.1	42.1	26.3
12–16	9	3	0	2	0	0	1	0	0	2	1	55.6	55.6	22.2
Total Girls	28	6	0	3	2	2	9	0	3	2	1			
Boys														
7–11	23	5	2	2	0	1	8	0	4	0	1	43.5	43.5	21.7
12–16	16	3	0	9	0	0	3	0	1	0	0	75.0	62.5	56.3
Total Boys	39	8	2	11	0	1	11	0	5	0	1			
	No.											Per cent of total group with low test	Per cent of total group with abnor. gums	Per cent of group with low test and abnor. gums
Total group (boys and girls)	67	14	2	14	2	3	20	0	8	2	2			
	Per cent of total group	20.9	3.0	20.9	3.0	4.5	29.9	0	11.9	3.0	3.0	52.2	49.3	31.3

* Inflammation around certain teeth, associated with caries, malocclusion, or heavy deposits of calculus.
† Increase less than 50 mg. on 2nd day of test.

definitely related to vitamin C deficiency (See p. 132) it appears that the winter diets especially must have been low in this vitamin. (See p. 156 for comments on diets.)

The tendency to inflammation of the gums was also shown in the other three Maine towns where studies were made (See Table 21) but the figures for those towns were lower than those for Newport. The differences are no doubt partly due to the fact that when the Newport examinations were made more of the cases of slight localized inflammation were included.

Six-hour vitamin C saturation tests. These tests were carried out in the fall of 1938 on a group of 67 of the Newport children in order to determine whether or not any relationship could be shown between the gum inflammation which had been found and vitamin C deficiency. The method used in carrying out the test was described on p. 87. Gum examinations were made by Dr. Woods approximately three weeks before the tests were begun and again shortly after they were completed. The criteria used in rating the gum inflammation were given on p. 88. The results of the tests are given in Table 23.

In the group of 67 children there were 34 with definitely healthy gums and 33 with abnormal gums. The abnormal group included 2 boys whose entire gums were redder than usual; one of these also showed some hypertrophy. According to Kruse (1942, p. 293) this redness is characteristic of the second stage in the sequence of pathological changes produced in the gums by vitamin C deficiency. Twenty-two others in the group with abnormal gums showed + to 2+ inflammation of the type which is considered characteristic of vitamin C deficiency; 4 showed only localized inflammation around certain teeth (associated with caries, malocclusion, or heavy deposits of calculus) and 5 showed gums which were pale in color and hypertrophied. Kruse (1942, p. 295) states that this pale color, with swelling, indicates beginning subsidence of the type of acute inflammation which is caused by vitamin C deficiency. Dr. Woods also came to this same conclusion at the time he made the gum examinations.

As shown in Table 23, approximately one-half (52.2%) of the total group showed an increased excretion of less than 50 mg. of vitamin C on the second day of the test (following a 400 mg.

dose of vitamin C in tablet form).[15] Both of the children with unusually red gums were in this group, together with approximately two-thirds (63.6%) of those showing + to 2+ inflammation. One-half of those with localized inflammation and three-fifths of those with pale, hypertrophied gums were also in this group.

Of the 34 children with healthy gums 14 showed an increased excretion of less than 50 mg. of vitamin C on the second day of the test. It thus appears that a child showing gum inflammation is very apt to show a low result in the vitamin C saturation test, but that the absence of gum inflammation does not necessarily indicate good nutrition with respect to vitamin C.

Since the same amount of vitamin C (400 mg.) was given to each subject on the second day of the saturation test, it seemed possible that, on account of their larger body size and greater activity, the older children might show a smaller increase in excretion on the second day of the test than the younger children. They would thus be falsely rated as being deficient in vitamin C. As indicated in Table 23 a higher percentage of the older children did show low results in the test. However, since, in the older group of boys, there was also a higher percentage who showed both inflamed gums and low results in the test it seems probable that the test dose used was high enough. The fact that a higher percentage of both boys and girls in the older age groups showed low results in this test indicates that vitamin C deficiency is particularly apt to occur during adolescence when the demand for this vitamin is high.

In case the saturation test is used in future studies, it may seem desirable to base the dosage of vitamin C (on the second day of the test) on body weight, according to the method of Harris and Abbasy (1937). A uniform dose of 400 mg. of vitamin C was used in the present study for the sake of simplicity in handling the children. The use of 50 mg. as the dividing line between high and low results allowed for considerable range in response in the large and small children.

The diet records secured on the two days of the tests did not indicate a very close relationship between the results of the tests and the amount of vitamin C in the diets on those two days. How-

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[15] Thirty-five and eight-tenths per cent of the group showed an increased excretion of less than 10 mg. on the second day of the test.

ever, in the group of 24 children who showed an increase of less than 10 mg. of vitamin C on the second day there were 9 whose diets were rated poor in vitamin C and only 4 which were rated good. The other 11 were rated fair.

TABLE 24

Results of Vitamin C Tests for Cure of Inflamed Gums
Newport, Spring 1939

Before therapy		After therapy					
Condition of gums	No. cases	Healthy		Definite improvement		No change	
		No.	Per cent	No.	Per cent	No.	Per cent
Healthy (controls)	3	3	100	0	0	0	0
General redness with hypertrophy	2	0	0	2	100	0	0
+ inflammation	10	3	30	4	40	3	30
++ inflammation	8	1	12.5	7	87.5	0	0
+++ inflammation	3	0	0	3	100	0	0
Total	26						

Vitamin C tests for cure of inflamed gums. This test was carried out in March 1939 on a group of 26 Newport children. The procedure used was described on p. 88 and a summary of the results is given in Table 24. It will be seen from the table that the 3 children who served as controls still showed healthy gums at the end of the test period of three weeks. Of the 23 others, 4 showed healthy gums, 16 showed definite improvement, and 3 no change at the end of three weeks. Of the 3 who showed no change one was a 14-year-old girl who had severe malocclusion. Another was a 9-year-old boy in poor physical condition, with extensive caries in his deciduous molars. The third was a 7-year-old boy who appeared to be in good general condition. His failure to respond to the increased intake of vitamin C cannot be explained. From these results it seems evident that most of the gum inflammation seen in the Newport children was of the type which responds to treatment with vitamin C.

HOME VISITS

Home visits in Newport were made in October, November, and December of 1937. Form 3 (Appendix) was used to record the following data for each child who was examined at school: family history, home conditions, home food production and preservation, prenatal conditions, early and present diets and health. Some difficulty was experienced in securing definite answers to a few of the questions, since the mothers often could not remember certain facts, especially regarding their own diets during pregnancy and the early diets and health of the children. As far as possible various topics will be considered in the same order as they are given in Form 3.

TABLE 25

Nationality of Parents of Newport Grade-school Children

	Both parents American	1 American 1 Canadian	1 American 1 Italian	1 American 1 English	1 American 1 Austrian (Jewish)
No. children	176	18	2	1	1
Per cent children	83.4	8.5	1.0	.5	.5

	Both parents Canadian	Both parents Finnish	1 Canadian 1 ?	1 French 1 ?	1 American 1 ?
No. children	5	2	1	1	4
Per cent children	2.4	1.0	.5	.5	1.9

NATIONALITY OF PARENTS

Information regarding the nationality of the parents was not secured for 29 of the 240 children whose homes were visited. Of the remaining 211 children 83.4 per cent had American parents; 8.5 per cent had one American and one Canadian parent; and 2.4 per cent had parents who were both Canadians. (See Table 25.) The only foreign countries represented were Italy, England, Austria, Finland, and France (one family each).

LANGUAGE SPOKEN IN THE HOMES

English was spoken in all of the homes visited, although in one home French also was spoken.

OCCUPATIONS OF CHIEF WAGE EARNERS

Classification of occupations. The occupations of the chief wage earners in the Newport families visited were summarized under the following headings:

1. Laborers. Persons doing manual work whose incomes were apt to be seasonable or variable, such as farm laborers, truck drivers, factory workers, road workers, carpenters, painters, garage workers, etc.
2. Business, professional, and semi-professional people. Persons such as doctors, dentists, owners of any business, government employees, salesmen, office workers, etc., whose incomes were usually either adequate or at least fairly regular.
3. Farmers. All persons owning or renting and operating farms.
4. Miscellaneous. Persons not included in the above groups, as: persons who were retired, on a pension, not working but on relief, etc.
5. Unemployed, with very little or no outside help.

In Table 26 the summary of occupations for Newport is given together with data for the other Maine towns in which similar studies were made in 1934-35.

It will be noted that the figures for Newport are not very different from those for Mars Hill, except that there were fewer persons unemployed in Newport. It should be explained, however, that in Newport 10.6 per cent of those classed as laborers were working on W.P.A. projects and 4.6 per cent of these were also receiving additional state or town assistance. Another 4.6 per cent of the group of laborers were receiving state or town assistance but were not working on W.P.A. projects. W.P.A. was not in existence early in 1935 when the studies were made in the other Maine towns.

TABLE 26

Classification of Occupations of Chief Wage Earners in Families of Grade-school Children in Four Maine Towns

Locality	Year	Total No. families	Laborers		Business professional, etc.		Farmers		Miscellaneous		Unemployed	
			Number of families	Per cent	Number of families	Per cent	Number of families	Per cent	Number of families	Per cent	Number of families	Per cent
Newport	*1937	132	66	50.0	38	28.8	13	9.8	7	5.3	8	6.1
Mars Hill	1935	92	38	41.3	26	28.3	10	10.9	2	2.7	16	17.4
Jonesport	1935	53	29	54.7	12	22.6	1	1.9	5	9.4	6	11.3
West Jonesport	1935	48	35	72.9	9	18.8	0	0.0	1	2.1	3	6.3
Monmouth	1935	43	11	25.6	11	25.6	14	32.6	5	11.6	2	4.7
North Monmouth	1935	31	21	67.8	5	16.1	3	9.7	1	3.2	1	3.2
Monmouth rural	1935	20	7	35.0	2	10.0	8	40.0	0	0.0	3	15.0
Totals		419	207	49.4	103	24.6	49	11.7	21	5.0	39	9.3

* Last quarter. All others are for first quarter.

TABLE 27

Education of Parents of Newport Grade-school Children

	Total No.	Did not complete elementary school		Completed only elementary school		Completed elementary and indicated number of years of high school								Completed elementary, high school and college or normal school		Completed elementary, some high school and business school	
						1		2		3		4					
		No.	Per cent	No.	Per cent	No.	Per cent	No.	Per cent	No.	Per cent	No.	Per cent	No.	Per cent	No.	Per cent
Fathers	128	10	7.8	51	39.8	5	3.9	16	12.5	10	7.8	27	21.1	3	2.3	6	4.7
Mothers	132	13	9.8	42	31.8	9	6.8	20	15.2	11	8.3	28	21.2	7	5.3	2	1.5

At the time the home visits were made, many housewives, whose husbands were in the group of laborers, commented on their low family incomes and the difficulty they were having in providing adequate meals. Inquiries made by the writer in the spring of 1940 indicated that economic conditions in Newport were worse during the school year of 1937-38 than during the other three years of the study.

In comparison with Newport there was a higher percentage of laborers in Jonesport, West Jonesport, and North Monmouth, where many worked in factories. In Jonesport and West Jonesport there were canneries where various fish products, such as clam chowder and herring, were canned. In North Monmouth there were several textile mills, but at the time the home visits were made most of the mills were running only part time. In Jonesport, West Jonesport, and North Monmouth the women of the families often earned some of the living by working part time.

As is indicated in Table 26, only 9.8 per cent of the Newport wage earners were classed as farmers, although 14.5 per cent of the families lived outside of the village. Monmouth was the chief farming town included in the present study, although there were very few farmers in North Monmouth. There was only one farm family in Jonesport. This is a seacoast town and the majority of families visited lived in the villages along the rocky shore where the soil is not well adapted to gardening.

EDUCATION OF PARENTS

The education completed by the fathers and mothers of the Newport grade-school children is summarized in Table 27. About 28 per cent of both parents had either finished high school or gone on to college, normal school, or business school. About 27 per cent had finished one, two, or three years of high school and about 36 per cent had only completed elementary school.

FOOD PRODUCTION AND PRESERVATION FOR FAMILY USE

Milk supply. In Table 28 information is given regarding the milk consumption of the Newport families as compared with the families in the other Maine towns where surveys were made. It

TABLE 28

Milk Supply in Families of Grade-school Children in Four Maine Towns

Locality	Year	Total No. families	Families having one or more cows			Av. fresh milk consumption per person in families having cows	Families without cows			Av. fresh milk consumption per person in families without cows	Families using only canned milk		Families* using fresh milk plus supplements of skim milk, cream, or canned milk	
			No.	Per cent	No. persons	Quarts	No.	Per cent	No. persons	Quarts	No.	Per cent	No.	Per cent
Newport	‡1937	136	23	16.9	133	.67	113	83.1	589	.37	12	8.8	22	16.2
Mars Hill	1935	90	20	22.2	113	.67	70	77.7	379	.21	9	10.0	38	42.2
Jonesport	1935	53	7	13.2	36	.71	46	86.8	267	.21	10	18.9	25	47.2
West Jonesport	1935	48	2	4.2	11	1.14	46	95.8	232	.20	16	33.3	27	56.3
Monmouth	1935	43	20	46.5	132	.45	23	53.5	109	.38	1	2.3	4	9.3
North Monmouth	1935	31	17	54.8	108	.76	14	45.2	76	.42	0	0.0	7†	22.6
Monmouth rural	1935	20	8	40.0	62	.80	12	60.0	67	.32	1	5.5	6	30.0
Totals		421	97	23.0	595	.66	324	77.0	1719	.29	49	11.6	129	30.6

* Families without cows.

‡ Last quarter. All others are for first quarter.

† One other family used skim milk only.

will be seen that the average daily milk consumption of the Newport families having cows (.67 qt. per person) was the same as the average for Mars Hill. The Newport average for families without cows (.37 qt. per person) was similar to the Monmouth average and somewhat higher than the Mars Hill, Jonesport, and West Jonesport averages. This average seems low, however, for rural communities where milk is produced in considerable quantity. A great deal of milk which was being shipped out of the state would have been retained for local use if the demand had been sufficient. Only 16.2 per cent of the Newport families without cows were using supplements of skim milk, cream, or canned milk. Twelve Newport families were using canned milk only.

Fresh milk being consumed in comparison to milk needed. In order to determine how the amounts of fresh milk consumed by Newport families compared with the amounts considered necessary for good nutrition, calculations of the requirements were made, based on a daily allowance of 1 quart for children under 5 years, 3 cups for children between 5 and 15 (inclusive), and 1 pint for those 16 and over. In Table 29 the results for Newport are compared with those previously secured for the other three Maine towns. It will be seen that fresh milk consumption in Newport was only a little more than half of that which is considered desirable for good nutrition. The total amount used was sufficient to adequately supply only the children under 16. The amount of fresh milk consumed in the town of Monmouth was much nearer to the amount needed than that used in any of the other three towns.

As is shown in Table 28 the milk situation in Mars Hill and Jonesport is not quite as bad as it appears in Table 29, since more families in these two towns were using canned milk and other supplements to the supply of fresh milk. It is unfortunate that it was impossible to secure accurate information regarding the amounts of these supplements which were ordinarily used. From the information obtained, however, it was very evident that the amount of cream, canned and skim milk used did not by any means supply the equivalent of the amount needed in addition to the fresh milk already being consumed.

TABLE 29

Fresh Milk Consumed in Comparison to Milk Needed in Families of Grade-school Children in Four Maine Towns

Locality	Year	Number families visited	Average number in household	Average number children under 5	Average number children between 5–15 (incl.)	Average quarts fresh milk consumed per day	Average quarts needed per day	Average quarts needed for children	Per cent of total milk needed which was consumed
Newport	1937*	136	5.3	.48	1.9	1.9	3.4	1.9	57.7
Mars Hill	1935	90	5.5	.40	2.2	1.7	3.5	2.1	48.6
Jonesport	1935	53	5.7	.64	2.2	1.6	3.7	2.3	43.2
West Jonesport	1935	48	5.1	.38	2.3	1.2	3.3	2.1	36.4
Monmouth	1935	42	5.6	.45	2.1	2.3	3.6	2.0	63.9
North Monmouth	1935	31	5.9	.58	2.3	3.5	3.8	2.3	92.1
Monmouth rural	1935	21	6.3	.95	2.2	3.5	4.2	2.6	83.3
Four Towns		421	5.5	.50	2.1	2.0	3.5	2.1	55.9

* Last quarter. All others are for first quarter.

TABLE 30

Percentage of Families Having Gardens and Chickens

Locality	Year data were secured	Total number families	Per cent having gardens	Per cent having chickens
Newport	1937*	136	80.1	16.9
Mars Hill	1935	92	91.4	37.0
Jonesport	1935	53	62.3	32.1
West Jonesport	1935	48	50.0	25.0
Monmouth	1935	43	93.1	51.2
North Monmouth	1935	31	100.0	35.5
Monmouth, rural	1935	20	100.0	60.0

* Last quarter. All others are for first quarter.

Vegetable gardens and chickens. The percentage of families in the different towns who had vegetable gardens and chickens is given in Table 30. It will be seen that 80.1 per cent of the Newport families had gardens but only 16.1 per cent had chickens. Newport was lower than Mars Hill or Monmouth in the percentage of families having gardens and lower than any of the other three towns in the percentage having chickens. The fact that Newport is a more compact village than either Mars Hill or Monmouth may partly account for the smaller percentage of families in that town who were producing some of their own food.

In Newport 15.4 per cent of the families were raising one or more animals, such as pigs or calves, for use as meat. Similar information was not secured for Jonesport and Monmouth, but in Mars Hill, in the fall of 1935, 45.4[16] per cent of the families were raising animals for meat.

Fruits. (See Tables 31 and 32.) Apples were the chief fruit, exclusive of berries, raised in the four towns where surveys were made. The percentage of families in each town who either had trees of their own or secured fruit from relatives was as follows: Newport 25.3, Mars Hill 10.8 (1934) and 16.5 (1935), Jonesport 4.0, and Monmouth 49.0. In Monmouth in 1934 a considerable number of families reported that they also raised pears, plums, cherries, and grapes.

[16] See footnotes to Table 31. P. 142.

TABLE 31

Percentage of Newport and Mars Hill Families Who Raised, Canned, and Stored Specific Foods*

Foods	Newport—1937–38 134 families†			Mars Hill—1935–36 121 families‡		
	Raised	Canned	Stored	Raised	Canned	Stored
	%	%	%	%	%	%
Fruits						
Apples and crab apples	25.3	16.4	11.9	16.5	49.6	14.1
Berries, kind unknown	—	2.2	—	—	—	—
Blackberries	14.9	17.2	—	—	—	—
Blueberries	13.4	15.7	—	19.0	23.1	—
Cherries	—	—	—	—	.8	—
Cherries, choke	—	—	—	1.7	.8	—
Cranberries	5.2	3.0	—	14.1	—	—
Currants	—	—	—	2.5	—	—
Gooseberries	—	—	—	2.5	5.0	—
Grapes	2.2	.8	—	—	—	—
Melons	3.7	—	—	—	—	—
Peaches	—	6.7	—	—	3.3	—
Pears	.8	5.2	—	—	3.3	—
Plums	1.5	6.0	—	5.8	25.6	—
Raspberries	47.0	36.6	—	9.2	80.2	—
Strawberries	20.9	25.4	—	63.6	57.9	—
Vegetables						
Beans, shell	10.5	11.9	—	9.1	9.9	—
Beans, string	75.4	73.1	—	90.9	80.2	—
Beets	65.7	27.6	32.8	82.6	49.6	38.0
Beet greens	65.7	6.7	—	82.6	28.9	—
Broccoli	3.0	—	—	—	—	—
Brussels sprouts	1.5	—	—	—	—	—
Cabbage	26.1	.8	—	46.3	.8	47.1
Carrots	64.9	11.2	46.3	85.1	33.9	63.6
Cauliflower	2.2	—	—	6.6	—	—
Catsup	—	1.5	—	—	—	—
Celery	3.0	—	—	—	—	—
Chard, Swiss	25.4	5.2	—	47.1	28.9	—
Corn	55.2	32.8	—	63.6	29.8	—
Cress	.8	—	—	—	—	—
Cucumbers	56.7	53.7 (Pickles)	—	69.4	95.9 (Pickles)	—
Dandelions	55.2	17.9	—	71.1	14.1	—
Endive	32.8	10.5	—	10.7	5.0	—
Fiddleheads	—	—	—	58.7	13.2	—
Greens, unspecified	3.0	16.4	—	—	—	—
Kale	.8	—	—	.8	—	—
Kohlrabi	—	—	—	3.3	—	—

* Or picked wild.

† 14.5 per cent were rural.

‡ 28.1 per cent were rural.

TABLE 31—(Continued)

Foods	Newport—1937–38 134 families†			Mars Hill—1935–36 121 families‡		
	Raised	Canned	Stored	Raised	Canned	Stored
Vegetables (Cont.)	%	%	%	%	%	%
Lettuce	56.7	—	—	81.8	—	—
Onions	7.5	—	—	33.1	—	—
Parsnips	8.2	—	2.2	27.3	—	15.7
Peas	42.5	28.4	—	76.0	41.3	—
Peppers	—	—	—	.8	—	—
Peppergrass	—	—	—	2.5	—	—
Potatoes	17.9	—	49.3	40.5	—	68.6
Pumpkin	16.4	—	11.9	32.2	3.3	17.4
Radishes	30.6	—	—	57.9	—	—
Rhubarb	.8	10.5	—	29.8	30.6	—
Rutabagas	39.6	—	29.1	47.9	—	61.2
Spinach	21.6	2.2	—	26.5	8.3	—
Squash	25.4	—	21.6	52.1	.8	24.0
Tomatoes	71.6	57.5	—	74.4	31.4	—
Miscellaneous						
Meat, fish, chicken	—	3.7	—	—	—	—
Mincemeat	—	11.2	—	—	—	—

In Newport raspberries were cultivated to some extent for the market and 47 per cent of the families reported that they either raised them or picked wild ones. As indicated in Table 31, strawberries, blackberries, blueberries, and cranberries were also picked for home use.

In Mars Hill in 1934 berries were raised or picked wild by 69.5 per cent of the families. Strawberries, raspberries, blueberries, high-bush cranberries, currants, and gooseberries were the kinds gathered. In 1935 (see Table 31) 63.6 per cent of the families reported that they picked strawberries. These were mostly wild.

Blueberries were plentiful in the vicinity of Jonesport and 79.2 per cent of the families reported that they picked them and one or more of the following other kinds of berries: raspberries, strawberries, cranberries (high- and low-bush), blackberries, gooseberries, and baked apple (cloud berries).

In Monmouth the only varieties mentioned were strawberries, raspberries, blueberries, and blackberries, which were picked by 78.7 per cent of the families.

TABLE 32

Percentage of Families in Four Towns Who Canned and Stored Specific Foods

Foods	Mars Hill 91 families		Jonesport 101 families		Monmouth 97 families		Newport 134 families	
	Summer–1934		Summer–1934		Summer–1934		Summer–1937	
	Canned	Stored	Canned	Stored	Canned	Stored	Canned	Stored
	%	%	%	%	%	%	%	%
Fruits								
Apples	19.8	2.2	11.9	1.0	10.3	9.3	11.9	11.9
Berries	69.2	—	79.2	—	78.4	—	55.9	—
Cherries	—	—	—	—	1.0	—	—	—
Crab apples	—	—	—	—	4.1	—	4.5	—
Cranberries	—	—	—	—	—	1.0	3.0	—
Grapes and grape juice	—	—	1.0	—	4.1	—	.8	—
Peaches	8.8	—	6.9	—	4.1	—	6.7	—
Pears	6.6	—	9.9	—	49.5	—	5.2	—
Plums	15.4	—	13.9	—	13.4	—	6.0	—
Vegetables								
Beans, shell	—	—	1.0	—	35.0	1.0	11.9	—
Beans, string	74.7	—	63.4	—	86.6	—	73.1	—
Beets	42.9	22.2	33.7	17.8	30.9	49.5	27.6	32.8
Cabbage	—	40.0	—	16.8	—	48.5	—	19.4
Carrots	16.5	50.4	11.9	46.5	5.2	72.2	11.2	46.3
Catsup	—	—	1.0	—	4.1	—	1.5	—
Cauliflower	4.4	—	—	—	2.1	—	—	—
Celery	—	—	—	—	—	1.0	—	.8
Corn	15.4	—	8.9	—	51.6	—	32.8	—
Greens	41.8	—	43.6	—	56.7	—	40.4	—
Mixture for soup	1.1	—	—	—	—	—	—	—
Onions	—	4.4	—	1.0	—	2.1	—	.8
Parsnips	—	6.7	—	2.0	—	6.2	—	2.2
Peas	42.9	—	42.6	—	43.3	—	28.4	—
Peppers	—	—	—	—	1.0	—	—	—
Pickles	56.3	—	69.3	—	84.5	—	53.7	—
Potatoes	—	76.7	—	75.3	—	83.5	—	49.3
Pumpkin	1.1	—	7.9	6.9	4.1	8.3	—	11.9
Rhubarb	11.0	—	8.9	—	9.3	—	10.5	—
Sauerkraut	—	1.1	—	—	—	—	.8	—
Rutabagas	—	60.0	—	57.4	—	51.6	—	29.1
Squash	2.1	5.6	4.0	10.9	2.1	11.3	—	21.6
Succotash	—	—	—	—	1.0	—	—	—
Tomatoes	31.9	—	8.9	—	79.4	—	57.5	—
Miscellaneous								
Beef	1.1	—	2.0	—	4.1	—	—	—
Chicken	3.3	—	2.0	—	1.0	—	2.2	—
Coots	—	—	2.0	—	—	—	—	—
Ducks	—	—	1.0	—	—	—	—	—

TABLE 32—(Continued)

Foods	Mars Hill 91 families		Jonesport 101 families		Monmouth 97 families		Newport 134 families	
	Summer–1934		Summer–1934		Summer–1934		Summer–1937	
	Canned	Stored	Canned	Stored	Canned	Stored	Canned	Stored
Miscellaneous (Cont.)	%	%	%	%	%	%	%	%
Fish, kind unspecified	—	—	14.9	—	2.1	—	.7	—
Herring	—	—	3.0	—	—	—	—	—
Mackerel	—	—	17.8	—	—	—	—	—
Meat, kind unspecified	1.1	—	2.0	—	11.3	—	—	—
Mincemeat	1.1	—	5.9	—	27.8	—	11.8	—
Pork	—	—	—	—	2.1	—	—	—
Veal	—	—	—	—	2.1	—	—	—
Venison	—	—	5.0	—	1.0	—	.7	—

Vegetables. The various kinds of vegetables raised by the Newport families in the summer of 1937 and by the Mars Hill families in the summer of 1935[17] are given in Table 31. The kinds of vegetables raised by 50 per cent or more of the Newport families were: string beans, beets, carrots, corn, cucumbers, dandelions (wild), lettuce, and tomatoes. Those raised by 50 per cent or more of the Mars Hill families included the same list plus fiddleheads (wild), peas, radishes, and squash. In Newport less than 25 per cent of the families raised the following vegetables which are important from a nutritive standpoint: spinach, potatoes, green peppers, kale, broccoli, and shell beans. In 1935 less than 25 per cent of the Mars Hill families raised green peppers, kale, broccoli, and shell beans.

Canning. (Fruits) As is shown in Table 32 berries were the kind of fruit canned by the most families in all four towns. (The figures in the tables do not include jellies and preserves.) Apples, plums, pears, and peaches were also frequently canned.

[17] In Mars Hill in 1935-36 an attempt was made to discover how much improvement in the nutritive status of grade-school children could be brought about through improvements in the family diets. In order to encourage gardening and canning, federal seeds were supplied to 33 parents who made application. Also an E.R.A. canning center was operated during the summer. This was used by approximately 45 families having children in the grade school.

Pears were especially popular in Monmouth, no doubt because they were available from trees in the locality.

(Vegetables) The vegetables canned by the most families in all four towns were string beans, pickles, and greens. Since pickles have very little food value in the diet, except as appetizers, it is unfortunate that so many housewives canned them in preference to more nutritious vegetables. Beets and peas also were canned often in all four towns. Corn was especially popular in Monmouth and Newport, shell beans in Monmouth, and tomatoes in Mars Hill, Monmouth, and Newport. The supply of ripe tomatoes in Mars Hill was fairly limited, since at the time this study was made families had not yet learned that, in order to secure sufficient ripe fruit during a short growing season, it is necessary to choose early varieties (see p. 180) and start the plants in the house. The data for Mars Hill, given in Tables 31 and 32, show that more of the Mars Hill families canned fruits and vegetables in 1935 than in 1934.

(Meats, poultry, fish, etc.) Meats were not canned by many families but mincemeat was canned by 27.8 per cent of the families in Monmouth and 11.8 per cent of those in Newport. In Jonesport 35.7 per cent of the housewives reported that they had canned fish; 5 per cent had canned venison, and 2 per cent coots (a sea bird).

Although the percentage of families, in all four towns, who canned certain fruits and vegetables was quite high the quantities canned by the majority of housewives were not sufficient to supply their families throughout the winter. At the time the home visits were made in Mars Hill, Jonesport, and Monmouth, early in 1935, many families had only a few jars left which they were saving for special occasions.

In the early spring, nearly all families made use of wild greens, such as dandelions and fiddleheads, but when these were gone there were no fresh garden vegetables available until the last of June. This means that there are long intervals in the late spring and early summer when many families have to buy all of the vegetables they use.

Storage. (Fruits) Apples were practically the only fruit stored in any of the four towns. (See Tables 31 and 32.)

(Vegetables) The chief vegetables stored in all four towns were beets, cabbages, carrots, potatoes, and rutabagas. Many Newport and Mars Hill (1935) families also stored squash.

PRENATAL HISTORY

As shown in Form 3 (Appendix) information was secured for each Newport child regarding the mother's diet and health during pregnancy and conditions prevailing at birth. In Table 33 this information is summarized separately for each of the four towns.

TABLE 33

Summary of Prenatal History and Basic Feeding during Infancy

Town	Total number of children	Abnormal pregnancy	Inadequate diet during pregnancy	Premature birth	Breast fed 5 months or more	Breast fed 9 months or more	Weaned from breast after 12th month
		%	%	%	%	%	%
Newport	230	17.3	79.2	2.7	34.4	28.3	3.1
Mars Hill	143	20.3	61.5	7.9	43.8	35.0	4.4
Jonesport	174	17.2	77.0	5.3	46.6	38.7	7.5
Monmouth	153	14.4	77.1	8.6	51.9	37.7	5.2

Character of pregnancies. It will be seen that, according to the statements of the mothers in the different towns, between 14.4 and 20.3 per cent of the pregnancies were abnormal, having been accompanied by persistent vomiting, kidney trouble, or other disturbances. Accurate information regarding diets during pregnancy was difficult to secure but approximately three-fourths of the diets were probably inadequate. Lack of sufficient milk was the chief dietary defect noted, although lack of sufficient fruits, vegetables, and eggs was commonly admitted.

Vitamin D in prenatal diets. In judging the adequacy of the prenatal diets, as reported in the table, vitamin D was not considered, since no mother was found in any of the four towns who had taken cod liver oil or any similar product containing vitamin D. As stated by Park (1940), "the foods that comprise the diet of the average person are almost lacking in vitamin D .... The amount in milk is negligible. Average butter is estimated as containing only 80 units per hundred grams, making its potency about one one-hundredth that of average cod liver oil. Liver may

contain a small amount but not enough to have any practical value." Hen's eggs may contain considerable amounts of vitamin D but the amount is extremely variable, since it depends on the amount of ultraviolet radiation (from sunlight or an ultraviolet lamp) which the birds receive and the amount of vitamin D in their food. For these reasons eggs are not considered to be reliable sources of the vitamin. Certain kinds of oily fish, such as herring, sardines, salmon, and tuna, contain significant amounts of the vitamin but are not ordinarily eaten in sufficient amounts to meet vitamin D needs during pregnancy. During the summer months it would be possible to secure adequate vitamin D from sunlight, but probably few women take sufficient advantage of their opportunity to secure it. It can be said, therefore, that most of the mothers were deficient in vitamin D during pregnancy.

Standards for calcium and vitamin D during pregnancy and lactation. The value of vitamin D in pregnancy and lactation has been emphasized by many workers in the field of nutrition. In an article in the Journal of the *American Medical Association,* Jeans and Stearns (1938) state that during pregnancy and lactation, calcium and vitamin D are the two factors most often deficient in the mother's diet. They emphasize that vitamin D alone does not insure adequate retention of calcium unless sufficient calcium is present in the diet. During pregnancy from 1.4 to 1.6 grams of calcium are needed daily. These are the amounts contained in 5 and 5.5 cups of milk. If the mother cannot drink sufficient milk to secure this amount of calcium, Sullivan (1944) suggests that dicalcium phosphate be prescribed by her physician. The same author recommends 600 to 1,000 units of vitamin D daily in the form of a concentrate from fish liver oil.

During lactation the drain on the mother is even more severe than during pregnancy and Jeans and Stearns (1938) state that ample calcium is imperative. They recommend a daily intake of at least 2 grams and at least 800 or more units of vitamin D.

History During Infancy

Premature births. As shown in Table 33 the percentage of premature births was lower in Newport than in the other three towns.

General condition at birth. The mothers of 219 of the Newport children gave reports of the general condition of their children at birth. The condition of 94.5 per cent of the babies was said to have been good; 2.3 per cent were described as "thin." One baby had jaundice; one, club foot; and two, ruptures.

Basic feeding. Table 33 shows that 34.4 per cent of the Newport children were breast fed 5 months or more, 28.3 per cent 9 months or more, and 3.1 per cent 12 months or more. These figures are lower than those secured in the other towns. The majority of the Newport babies who were artificially fed received modified fresh cow's milk, although 11.5 per cent received evaporated, condensed, or dried milk for at least part of their first year. When feeding problems occurred, various proprietary infant foods were often tried. Many of these are dextrinized or malted cereal products, sometimes containing in addition one or more of the following: lactose, inorganic salts, and powdered cow's milk. Most of them are added to fresh cow's milk, although a few, which contain sufficient milk, merely require the addition of water. These preparations are relatively expensive, selling for between 69 and 94 cents a pound.

Choice of sugar for infant feeding. The sugars commonly used in infant feeding are: cane sugar, corn syrup, dextrimaltose, and lactose. According to the Council on Foods of the American Medical Association (1937) "the choice of sugar for use in infant feeding is of relatively minor importance as compared with other problems of infant feeding." There are times, of course, when physicians prescribe one carbohydrate preparation in preference to another, especially for its laxative or non-laxative effect. It would appear, therefore, that unless the physician advises to the contrary it would be better to use an inexpensive sugar such as Karo corn syrup rather than the more expensive carbohydrate preparations. That would leave more money to be spent for orange juice, cod-liver oil, and other necessary supplements.

Substitutes for fresh cow's milk. In Newport, as well as in the other towns, various brands of evaporated and condensed milk were used. One Newport child received plain dried milk, 5 evaporated milk, and 20 condensed milk for at least a part of the first year. Condensed milk is ordinarily sweetened, the finished product containing 40 to 45 per cent of cane sugar. According to Marriott (1935, p. 204) it "is not a suitable food for infant feeding. When

given in sufficient amount to supply the necessary calories, there is too little milk present to provide sufficient protein, mineral salts, and vitamins. Such a one-sided diet may lead to rapid increase in weight, but infants are as a class flabby and have very poor resistance to infections."

Evaporated or dried milk is much better suited to infant feeding, since the amount of sugar added to the formula can be properly regulated. Most evaporated and some dried milks are now irradiated, which adds vitamin D, not enough, however, to completely supply the needs of the infant.

TABLE 34

Data on Infant and Preschool Diets

Town	Total number of children	Supplements during first year							Preschool diets	
		Orange juice	Tomato juice	Orange juice, tomato juice, or both	Cod liver oil	Egg	Vegetables including potatoes	Cereals	Average amount milk daily after 1st year	Cod liver oil* daily after 1st year
		%	%	%	%	%	%	%	cups	%
Newport	230	60.4	25.6	62.2	38.7	69.6	85.6	87.4	3.0	20.5
Mars Hill	138	64.5	13.0	64.5	29.0	56.5	65.8	70.0	2.6	11.3
Jonesport	168	58.3	8.9	58.3	17.3	45.8	72.6	75.0	2.7	15.6
Monmouth	153	55.7	24.2	58.8	18.3	58.1	79.1	86.4	2.8	5.8

* Or other vitamin D preparation.

Supplements during infancy. The mothers in the four towns were questioned regarding the foods, other than milk, which the babies had received during their first year. Very few remembered accurately the month when each food was begun or the amount given, but it was possible to secure statements regarding the kinds of foods given. A summary of this information is given in Table 34. It will be seen that the percentage of children who received orange juice, tomato juice, or both was about the same in the four towns. A higher percentage of the Newport children received cod liver oil, egg, and vegetables (including potato), but the percentage of children who had cod liver oil was significantly low in all towns.

Next to potato, carrots were the vegetable most often fed. In all four towns cereals and vegetables were the supplements most generally used, but very often potato was the chief vegetable fed.

Need of breast-fed babies for vitamin D. Some parents, as well as physicians, are of the opinion that breast-fed babies do not need cod liver oil (or other source of vitamin D) as a preventive of rickets. Jeans and Stearns (1938) and other authorities state that, since mother's milk varies in its vitamin D content, and babies in their store of vitamin D at birth, it is best to give breast-fed babies the same amount as is prescribed for those artificially fed. Jeans and Stearns (1938) state that the vitamin D requirement of the full term artificially fed baby is between 300 and 400 units a day. Premature babies may require twice this amount during the period of most rapid growth.

Feeding problems. In the Newport group 21.5 per cent of 219 babies were reported to have had feeding problems or frequent digestive upsets. Most of the feeding problems were said to be due to the failure of breast milk or cow's milk formulas to agree with the children. Three babies could not tolerate orange juice.

Illnesses during the first year. Following is a summary of the illnesses reported for 196 of the Newport babies during their first year:

	%		%
Abscesses	.5	Kidneys	.5
Anemia	.5	Measles	5.6
Bronchitis	1.5	Mumps	1.0
Chicken pox	2.0	Pneumonia	3.1
Colds	2.6	Rickets	.5
Croup	.5	Scarlet fever	.5
Ear abscess	1.0	Tape worm	.5
Intestinal flu	1.5	Whooping cough	6.6
Jaundice	.5	Worms	.5

PRESCHOOL HISTORY

Food dislikes. The preschool children in all four towns had numerous food dislikes and the majority of these were among the commonly used vegetables. In Newport 26.5 per cent of the children disliked one or more kinds, the ones most frequently mentioned being carrots, onions, greens, tomatoes, string beans, pota-

toes, and rutabagas. Meat was disliked by 5.7 per cent and milk by 2.6 per cent.

Foods withheld. Among the Newport children 30 per cent had certain foods withheld during their first three years. Those most frequently mentioned were dried beans and meat. Corn, pickles, and fried meats were also withheld by several mothers.

Milk consumption. As shown in Table 34 the average daily milk consumption of the Newport preschool children was 3 cups; 35.7 per cent of the group had 2 cups or less. The averages for the other three towns were slightly lower.

Sources of vitamin D. Table 34 also shows that about one fifth of the Newport children had received cod liver oil or other source of vitamin D regularly during their preschool years; about half of the children had received none. The percentage figures for the other towns are somewhat lower. A considerable number of the children in all four towns had received such preparations as Scott's Emulsion, Father John's Medicine, and Wampole's Tonic, which cost more than cod liver oil in proportion to their vitamin D content. Many mothers stated that their older children would not take cod liver oil but few had tried giving any of the vitamin D (and A) concentrate preparations in capsule form.

Standards for vitamin D. Jeans and Stearns (1938) state that for children between infancy and adolescence a daily allowance of from 300 to 400 units of vitamin D is satisfactory. Follis, Jackson, Eliot, and Park (1943) also emphasize the importance of vitamin D throughout the period of skeletal growth. McBeath and Zucker (1938) recommend 800 units daily as a preventive of dental caries. During the late fall and winter the sunlight which reaches Maine is deficient in the actinic rays which generate vitamin D in the skin. Therefore it is advisable to give preschool and older children cod liver oil (or a similar source of vitamin D) regularly between September and June. Cod liver oil and other fish oils are also valuable for their content of vitamin A.

The question of "sweets." According to the mothers, 40.3 per cent of the Newport children had eaten many sweets during their preschool years. Dr. H. C. Sherman (1929) gave the following advice regarding the use of sugar in children's diets: "Sugar should be of all foods the most cautiously used in feeding children lest it displace too much of the foods which can do what it cannot in supplying the proteins, vitamins, and mineral elements which

children need so urgently and so abundantly for their healthy growth and development."

General health and appetite. In Newport 88.8 per cent of the preschool children were reported to have had good health and 88.0 per cent good appetites.

Illness. The illnesses reported for the preschool years will be summarized with those for the school years. See p. 170.

FOOD HABITS OF GRADE-SCHOOL CHILDREN

On the day of the home visit each mother was asked to state as nearly as possible what each child had eaten the previous day. At the same time questions were asked regarding the type of meals which he usually had, his food preferences, the frequency with which he ate certain foods, and his health habits, illnesses, etc.

Foods eaten the day before the home visits. The information secured regarding the foods which the children had eaten the day before the home visit was probably fairly accurate, since such a short time had elapsed. While a record of the foods eaten on a single day may, in certain cases, give an incorrect impression of the child's customary diet, the averages obtained from a large number of such records give a valuable indication of food habits in a certain locality. A summary of the information obtained in Newport, together with that for the other three towns, is given in Table 35.

Consumption of various foods. In the table the data have been classified in such a way that it is possible to determine what types of foods were consumed most and how consumption varied in the different localities. The figures given for milk are not for the amounts consumed on the day preceding the visit but are for the average daily consumption as stated by the mothers.

(Milk.) It will be noted that the average daily milk consumption of the Newport children was 2.2 cups, which is close to the average for the four towns. Milk consumption was highest in Monmouth and lowest in Jonesport, but even in Monmouth only 44.3 per cent of the children received 3 or more cups per day. In Newport 31.0 per cent of the children received 3 or more cups daily.

(Fruit.) In all four towns only 53.2 per cent of the children had fruit of any kind, the highest consumption being in Newport and the lowest in rural Monmouth. The higher fruit consumption in Newport may be partly explained as being due to the fact that

TABLE 35

Percentage of Children Who Were Served Various Foods the Day Before the Home Visit

	1937–38	1934–35								
	Newport	Mars Hill	Jonesport	West Jonesport	Average Jonesport and West Jonesport	Monmouth	North Monmouth	Monmouth rural	All Monmouth	Average of four towns
2 to 2.9 cups milk	26.8	27.7	25.6	22.9	24.2	31.0	16.0	24.3	24.7	25.8
3 cups milk or more	31.0	26.4	20.0	21.8	20.9	33.8	60.0	43.2	44.3	30.4
Average cups milk per child	2.2	2.1	1.7	1.9	1.8	2.1	2.9	2.5	2.4	2.1
Fruit, any kind besides fruit pudding or pie	65.4	47.3	42.2	56.2	49.4	46.5	56.0	29.8	45.6	53.2
Citrus fruit	12.6	18.9	10.0	29.2	19.9	23.9	30.0	2.7	20.9	17.6
Tomatoes	8.2	16.2	3.3	6.3	4.8	14.1	12.0	16.2	13.9	10.2
Citrus fruit and/or tomatoes	20.0	29.7	13.3	31.2	22.5	33.8	38.0	18.9	31.6	25.2
Raw vegetable, excluding tomatoes	3.5	0.0	1.1	5.2	3.2	0.0	2.0	2.7	1.3	2.2
*2 vegetables, not tomatoes, potatoes or dried beans	26.4	24.3	24.4	12.5	18.3	22.6	38.0	2.7	22.8	23.1
*1 (only) vegetable, not tomatoes, potatoes, or dried beans	31.6	45.3	21.2	19.8	20.5	28.2	18.0	54.0	31.0	31.4
Baked beans	15.2	21.0	33.3	11.5	22.0	12.7	22.0	21.6	17.7	18.7
Baked beans only, as a vegetable, besides potatoes and tomatoes	3.0	7.4	13.3	8.3	10.7	7.0	16.0	16.2	12.0	7.8
Potatoes, once only	43.3	50.8	71.2	54.2	62.4	60.6	42.0	43.3	50.7	51.4
Potatoes, twice or more	48.5	43.2	13.3	29.2	21.5	24.0	30.0	35.2	28.5	36.1
Meat, poultry, or fish once only	45.9	50.7	73.4	53.1	62.9	53.5	50.0	48.7	51.3	52.4

* Not including vegetable pies such as pumpkin and squash.

TABLE 35—(Continued)

	1937–38	1934–35								
	Newport	Mars Hill	Jonesport	West Jonesport	Average Jonesport and West Jonesport	Monmouth	North Monmouth	Monmouth rural	All Monmouth	Average of four towns
Meat, poultry, or fish twice or more	27.7	35.2	11.1	36.4	24.2	35.2	26.0	13.5	27.2	28.2
Eggs	29.9	23.6	7.8	20.8	14.5	15.5	32.0	13.5	20.2	22.6
Cereal, any kind	85.3	71.7	57.8	65.6	61.8	76.1	70.0	81.1	75.4	74.3
Whole grain cereal	72.3	56.1	37.7	46.8	42.4	67.6	56.0	75.7	65.8	59.8
Hot breads	25.5	37.1	23.4	37.5	30.7	19.7	28.0	35.2	26.0	29.3
Doughnuts, cookies, or cake	80.5	71.7	77.8	94.8	86.6	84.6	94.0	84.0	88.0	81.9
Doughnuts, cookies, or cake twice or more	49.8	44.5	40.0	52.1	46.2	50.8	46.0	43.2	47.5	47.3
Puddings and pies	39.4	39.9	30.0	21.8	25.8	43.7	52.0	35.2	44.3	37.1
Fruit puddings and pies	15.2	11.5	12.2	3.1	7.5	29.5	28.0	21.6	27.0	15.1
Vegetable pies	9.5	8.8	4.4	1.0	2.7	1.4	0.0	2.7	1.3	5.8

the home visits in that town were made in the late fall and early winter when more apples were available.

The consumption of citrus fruit was quite variable in the different towns, the percentage range being from 2.7 in rural Monmouth to 30.0 in North Monmouth. Only 12.6 per cent of the Newport children had it. In all four towns oranges were available in the village grocery stores at the time the home visits were made, but apparently the price was too high for many of the families.

The consumption of tomatoes also was variable and low in all towns. Only 8.2 per cent of the Newport children had them. The lowest consumption was in Jonesport where fewer families had gardens in which they could raise their own crop for canning.

Considering the citrus fruits and tomatoes in one group, on account of their vitamin C content, it will be seen that in all four towns only 25.2 per cent had one or the other, or both, the day before the home visit. The consumption of other foods which are good sources of vitamin C (such as raw cabbage, raw rutabagas, and raw salad greens) was negligible, as can be seen in the table.

(Vegetables.) It is considered desirable that children should have at least two vegetables daily besides potato and that, in order to supply vitamin A, at least one should be green or yellow. In all four towns 23.1 per cent of the children had two vegetables, not including tomatoes, potatoes or dried beans and 31.4 per cent had only one. However, these figures do not include pumpkin and squash used in pies. In Newport only one child had any leafy greens (not including 8 who had head lettuce) but 47.2 per cent had at least one serving of such green and yellow vegetables as peas, string beans, carrots, squash, and pumpkin. This figure includes the squash and pumpkin used in pies. The consumption of squash and pumpkin was higher in Newport than in the other towns owing to the fact that the Newport home visits were made during the Thanksgiving season when more of these vegetables are used. Rutabagas were eaten by 4.8 per cent of the Newport children. This vegetable can be an excellent source of vitamin C if eaten raw or cooked for a short time in a small amount of water. However, even though yellow in color it is low in vitamin A.

In Mars Hill the vegetables (besides tomatoes, potatoes, and dried beans) eaten most were string beans, carrots, and rutabagas;

Jonesport children ate mostly onions and rutabagas, while those in Monmouth favored string beans, cabbage, carrots, and corn.

Baked beans were eaten quite generally, the most being used in Jonesport. The average for all four towns was 18.7 per cent. This figure no doubt would have been higher if diet records for Saturdays had been obtained on Sundays. Dried beans are a good source of protein, calcium, iron, and vitamin B_1. They also contain riboflavin and niacin but are low in vitamin A and lacking in vitamin C. On account of their protein, iron and vitamin B (complex) content they can be used to some extent (especially during war time) as a substitute for meat, fish, poultry, and eggs. However, since the protein of dried beans (except soy bean protein) is of rather poor quality they should not be used too frequently as a substitute for these foods.

Potatoes were eaten once or more by 87.5 per cent of the children in all four towns. As would be expected, the highest percentage of those who ate them was in Mars Hill. Considering their high nutritive value it is fortunate that they are so widely used. In composition they resemble enriched white bread and contain, in addition, a small amount of vitamin A and considerable vitamin C (if cooked to prevent loss).

(Meat, poultry, and fish.) As shown in Table 35, meat and fish were used very generally in all four towns; poultry was used much less frequently. Beef was the meat used most and pork next. The most pork was used in Mars Hill and the least in Monmouth. Frankfurters were especially popular in Jonesport where 12.6 per cent of the children ate them on the day before the home visit. In Newport a number of the families were eating venison at the time of the home visits. Several housewives stated that they were fortunate to have it, since they could not afford to buy other meat.

As would be expected, much more fish was used in Jonesport than in the other towns. In Mars Hill, Jonesport, and Monmouth clams were mentioned most often but in Newport oysters were more popular at the time of the home visits. Canned salmon was used a great deal in Newport, Mars Hill, and Monmouth.

(Eggs.) The percentage of children who ate eggs on the previous day ranged from 7.8 in Jonesport village to 32.0 in North Monmouth. In Newport 29.9 per cent of the children had them.

(Cereal.) Cereal breakfast foods were used on the previous

day by an average of 74.3 per cent of the children in all four towns, the percentage of those who had them being highest in Newport. The figures for whole grain cereal show that 80.5 per cent of those who ate breakfast cereal had some kind made from whole grain. Approximately half of the cereal used was oatmeal.

(Flour products.) Home made flour products such as biscuits, rolls, cookies, cakes, doughnuts, and pies were very popular in all four towns. Hot breads were eaten by 29.3 per cent of the children and an average of 81.9 per cent had cookies, cake, or doughnuts. Moreover, an average of 47.3 per cent of the children had them twice or more on the day before the home visit. Practically all of the cake, doughnuts, and pies and many of the cookies and hot breads were made from white flour, which at that time was not enriched.

(Desserts.) An average of 37.1 per cent of the children in all towns had puddings and pies for dessert, 15.1 per cent of which contained fruit and 5.8 per cent pumpkin or squash.

Foods ordinarily eaten. (*Breakfasts.*) According to the reports of the Newport mothers, 89.7 per cent of the children ordinarily had good appetites and 84.3 per cent ate a sufficient amount of food at breakfast. However, the reports of the kinds of foods usually eaten by many of the children for breakfast showed a tendency to omit fruit and to include a doughnut or cookie along with cereal, toast, and milk or cocoa to drink. Eggs also were frequently eaten. Occasionally pie, cake, and baked beans were mentioned as items in the breakfasts.

(*Dinners and suppers.*) Dinners eaten at noon at home were ordinarily fairly substantial meals which included meat or fish, potato, bread, another vegetable, and dessert (usually cake, pie, or pudding). Suppers, however, were apt to be poorly planned. Very often they consisted of hash made from left over vegetables and meat, mixed vegetables, or potato only, bread, rolls, or biscuits, canned fruit ("sauce"), cake or cookies, and milk. Other dishes sometimes served for suppers were: cold meats, baked beans, eggs, fish chowders and stews made with milk, soups and stews containing meat and vegetables, and escalloped macaroni with cheese and/or tomatoes. Freshly cooked vegetables, except potatoes, salads made with raw vegetables, creamed vegetable soups (except tomato), and fresh fruits were seldom served for suppers.

(*Box lunches eaten at school.*) The majority of the lunches

eaten by the children at school consisted of sandwiches, milk, fruit, and cake, cookies, or doughnuts. Very few contained any raw vegetables. Many of the children also had candy following their lunches. At the time the home visits were made no hot school lunches were being served in any of the four towns, although at present hot lunches are being served in Newport.

TABLE 36

Cooked Vegetables, Besides Potato, Eaten Most by Newport Grade-school Children

Vegetable	No. times vegetable was mentioned	Per cent of group of 240 children	Vegetable	No. times vegetable was mentioned	Per cent of group of 240 children
1. Carrots	160	67.1	10. Greens	46	19.2
2. Tomato	156	65.0	11. Onions	20	8.3
3. Beets	80	33.3	12. Tomato (in soup)	9	3.8
4. String beans	77	32.1	13. Mixed veg. (in soup)	6	2.5
5. Cabbage	77	32.1	14. Parsnips	5	2.1
6. Peas	74	30.1	15. Baked beans	2	.8
7. Rutabagas	70	29.2	16. Lima beans	2	.8
8. Squash	64	27.1	17. Shell beans	2	.8
9. Corn	53	22.1	18. Cauliflower	1	.4

(*Cooked vegetables, besides potato, eaten most.*) The cooked vegetables eaten most by the Newport grade-school children are given in Table 36 in the order of the frequency with which they were mentioned by the mothers. It is of interest that carrots and tomatoes, two of the most nutritious vegetables which are commonly available, headed the list. Only 4 of 240 children were said to like all cooked vegetables; 123 (51.2 per cent) liked more than three kinds; and 31 (12.9) per cent disliked all cooked vegetables and ate very few or very little of any kind.

(*Preferred raw vegetables.*) The raw vegetables eaten most were as follows, in the order of frequency with which they were mentioned: cabbage, carrots, lettuce, onions, and rutabagas. However, in October, November, and December of 1937 only 10 (4.2 per cent) were eating a raw vegetable at least once a day, and for 5 of these the raw vegetable was onions. (In one family onions

were sliced and allowed to stand in vinegar. The writer considered these as pickles rather than raw vegetables since the vinegar would cause the rapid loss of the vitamin C in the onions.) Approximately 12 per cent of the children had a raw vegetable between three and six times a week; 30 per cent had one once or twice a week; 26 per cent had one only occasionally, and 26 per cent had none. No doubt raw vegetables, especially tomatoes and lettuce, were eaten more often during the summer months.

(*Fruits eaten most.*) The fruits eaten most were as follows, in the order of frequency with which they were mentioned: apples, bananas, oranges, grapefruit, and grapes. Only 5 per cent of the children had oranges or grapefruit once a day or more; 27.5 per cent had them three to six times a week; 13.3 per cent had them once or twice a week, and 31.3 per cent had none. The low consumption of citrus fruits at the time of the home visits (fall 1937) was no doubt partly due to the fact that these fruits were rather high priced at that time of year and many families were in unusually poor financial circumstances. (Diet records kept for one week by the children in the spring of 1938 showed that only 11.2 per cent of the children had citrus fruit at least once a day.)

(*Cereals eaten most.*) The cereals eaten most, in order of frequency, were as follows: oatmeal, shredded wheat, cornflakes, Cream of Wheat, puffed wheat, Maltex, Wheaties, Ralston, and puffed rice. The popularity of cornflakes is rather significant, since, at the time this survey was made, this cereal was not enriched and the food value was low in comparison to that of oatmeal, shredded wheat, and other whole grain cereals.

(*Frequency of eating dark breads.*) The results of the Newport study indicated that 18.4 per cent of the children ate dark bread once a day or more; 34.3 per cent had it between one and six times a week, but 27.6 per cent had none. Many of the families frequently had homemade Graham rolls and Boston brown bread. Purchased dark breads included whole wheat, cracked wheat, and rye breads. The low consumption of dark breads was more significant at the time this survey was made than it would be at present, since at that time breads, flour, and cereals were not enriched. Since these findings indicate a general preference for white bread and the frequent use of refined breakfast cereals, it seems important that government regulations providing for the enrichment of cereal products should be continued after the war.

(*Favorite desserts.*) The desserts mentioned most often were pies, puddings, cakes, cookies, and doughnuts. Fresh fruits were not often used as desserts but canned fruit was frequently served for suppers with cake or cookies.

(*Frequency of eating candy.*) According to the statements of the Newport mothers 57.1 per cent of the grade-school children had candy oftener than twice a week; 28.7 per cent had it once a week or less.

(*Milk consumption.*) The average daily milk consumption (including milk in cocoa) of the Newport children was 2.2 cups. Thirty-one per cent received 3 cups or more and 26.8 per cent 1 cup or less. (For a comparison of the results with those for other towns, see Table 35.)

(*Tea, coffee, and cocoa.*) Among the Newport children coffee was drunk once a day or oftener by 10 per cent of the children but very few drank tea. The consumption of cocoa as compared with that in the other three towns is given in Table 37.

TABLE 37

Percentage of Children Who Drank Cocoa

	Daily	Less often	None
	Per cent	Per cent	Per cent
Newport	27.4	62.9	9.7
Mars Hill	29.5	50.0	20.5
Jonesport	18.4	53.2	28.4
Monmouth	21.9	48.4	29.7

(*Source of vitamin D.*) Questions regarding the use of cod-liver oil or other source of vitamin D during the winter months showed that only 10.3 per cent of the Newport children were getting it regularly. A comparison of data for all four towns is given in Table 38. The higher percentage for Jonesport can be explained as being due to the fact that physicians in that town were distributing cod liver oil supplied by the F.E.R.A. As stated before, many mothers in all four towns complained that the children would not take plain cod liver oil but few had tried giving any of the vitamin D concentrates in capsule form.

TABLE 38

*Percentage of Children Taking Cod Liver Oil**

Newport—1937–38			Mars Hill—1934–35			Jonesport—1934–35			Monmouth—1934–35		
Total No. in group	Per cent regular	Per cent irregular	Total No. in group	Per cent regular	Per cent irregular	Total No. in group	Per cent regular	Per cent irregular	Total No. in group	Per cent regular	Per cent irregular
234	10.3	4.7	148	14.2	4.0	186	22.5	4.8	158	4.4	3.8

* Or other vitamin D preparation.

Diet records kept at school by grade-school children. During the four-year Newport study diet records for one week were kept at three different times (fall 1936, spring 1938, and spring 1940) by all children above the third grade. Similar records were also secured in Mars Hill in the spring of 1937. Form 4 (Appendix) was used for the records and the teachers gave time twice a day to assist the children in writing down what they had eaten, together with approximate amounts or number of servings. In Table 39 is given the percentage of children who met or exceeded the standard for each food group. The standards for a good diet were adapted from Stiebeling and Clark (1939).

The table indicates that about three-fourths of the children in the two towns met the potato standard and over half met the standard for meat, fish, or poultry. The percentages for the other food groups were lower and decreased in the following order: eggs, whole grain products, milk, other fruits and vegetables, citrus fruits and/or tomato, and green or yellow vegetables. The very low figures for citrus fruit and/or tomato and green or yellow vegetables are especially significant, since these foods are needed in the diet to supply vitamins C and A. The Newport figures for green and yellow vegetables seem particularly low considering the fact that on the day before the home visit 47.2 per cent of the children were said, by the mothers, to have had a green or yellow vegetable. Possibly the discrepancies in the data obtained from the two types of records may be partially explained by the differences in time when the records were obtained; by the fact that, in some cases, the mothers may have mentioned the foods served, and the children only those actually eaten; and by the fact that the figures

TABLE 39

Per cent of Newport and Mars Hill Grade-school Children Who Met or Exceeded the Standards for a Good Diet

	Year	No. in group	No. days	Group 1 Milk	Group 2 *Citrus fruit and/or tomato	Group 3 Green or yellow vegetable	Group 4 White potato	Group 5 Other fruits and vegetables	Group 6 Eggs	Group 7 Meats, fish, poultry	Group 8 Whole grain products
Minimum standard number servings per day				cups 3	1	1	1	2	.5	1	1
				Per cent	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent
Newport	Fall 1936	94	5 to 7	40.4	5.3	9.6	85.1	33.0	40.4	57.5	41.5
	Spring 1938	125	5 to 7	26.4	16.8	8.0	87.2	15.2	44.0	51.2	39.2
	Spring 1940	131	5 to 7	29.0	6.1	6.1	68.7	17.6	58.0	60.3	41.2
Mars Hill	Spring 1937	126	5 to 7	15.9	13.5	.8	72.2	7.1	57.1	61.1	18.3

* Also canteloupe, fresh red raspberries, and fresh strawberries.

Note: Dry legumes, extra green and yellow vegetables, and extra citrus fruits and tomatoes were counted in group 5. Extra foods in groups 6 or 7 were counted so as to satisfy both groups as nearly as possible.

from the children's records given in Table 39 are based on averages for 5 to 7 days. This would probably make them lower than those based on the single day's records given by the mothers. The evident tendency of the children to eat more of the group 5 vegetables and fruits in the fall and more citrus fruits and eggs in the spring can be partly explained on the basis of differences in the availability and price of these foods at the two seasons of the year.

General character of diets. The above information regarding the foods eaten by the grade-school children in the four towns indicates a relatively high consumption of potatoes, dried beans, cereals, sugar, and white flour products; a moderate consumption of meat and fish, and a relatively low consumption of milk, eggs, fruit (especially citrus), and cooked and raw vegetables (exclusive of potatoes and dried beans). This type of diet tends to be above the average in carbohydrate and low in fat and/or protein, minerals, and vitamins.

A typical diet. In order to indicate the specific deficiencies which characterized many of the diets, a typical diet of a fourteen-year-old boy is given in Table 40. This diet includes foods which are commonly eaten in Maine and indicates the type of meals which many of the grade-school children had on the day before the home visit. It is close to the standard in calories, protein, iron, and vitamin A but is somewhat high in carbohydrate[18] and low in calcium, vitamin B_1,[19] riboflavin, niacin, and vitamin C. The most evident deficiency is in vitamin C. (For comments on vitamin D see p. 161.) As shown in the lower part of Table 40, the deficiency in vitamin C could be almost completely corrected by the addition of 1 cup of tomato juice. The tomato juice would also supply additional vitamin A and would bring the riboflavin and niacin up to the standard. By retaining the tomato juice and substituting enriched white bread for the unenriched the diet could be brought up to the standard in all respects except for calcium and a small amount of vitamin C.

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[18] According to Chaney and Ahlborn (1939) the commonly accepted distribution of the three foodstuffs in the diet of the average American child, in terms of the percentage of the total calories, is carbohydrate 50, fat 35, and protein 15.

[19] In some families, especially in Mars Hill, pork was used quite extensively. Since lean pork is high in vitamin B_1, diets containing sufficient amounts of it would not be deficient in this vitamin.

TABLE 40

Typical Diet of a Fourteen-Year-Old Boy

Height 62 inches
Weight 103 pounds

Foods	Measure as served	Wt.	Cal.	Carb.	Pro.	Ca	Fe	Vitamins				
								A	B_1	Ribo-flavin	Niacin	C
		gm.		gm.	gm.	mg.	mg.	I.U.	mg.	mg.	mg.	mg.
Breakfast												
Oatmeal	1⅓ cups	204.0	150	25.2	6.3	30.0	1.82	trace	.210	.057	.49	0.0
Sugar	2 teaspoons	8.7	33	8.7	0.0	0.0	0.00	0	.000	.000	.00	0.0
Milk, pasteurized	½ cup	122.0	85	6.0	4.1	145.5	.30	235	.055	.266	.13	1.8
Cocoa (½ milk)	1 cup	254.7	141	15.8	5.1	151.5	.46	235	.060	.289	.16	1.3
Toast, white, unenriched	4 slices	120.0	300	61.3	10.5	69.0	.93	trace	.050	.117	.72	0.0
Butter	1½ tablespoons	19.5	150	0.0	.2	3.0	.05	825	.000	.000	.00	0.0
Dinner												
Round steak, lean, ground	1 large cake	139.0†	200	0.0	27.2	16.0	3.85	37	.224	.307	8.87	0.0
Mashed potato	1 cup	186.0	200	41.8	4.6	56.0	2.00	400	.124	.154	.67	10.0
String beans, canned (solids)	⅔ cup	100.0	36	6.6	2.0	33.0	.72	950	.054	.132	.66	2.3
Bread, white, unenriched	2 slices	60.0	150	30.7	5.3	34.5	.47	trace	.033	.059	.36	0.0
Butter	1 tablespoon	13.0	100	0.0	.1	2.0	.03	550	.000	.000	.00	0.0
Chocolate cake, chocolate frosting	1 piece	85.0	357	58.6	3.8	38.3	.64	152	.040	.096	.30	0.0
Gum drops	5 large	50.0	160	43.0	0.0	0.0	.00	0	.000	.000	.00	0.0
Supper												
Potato hash*	1 cup	186.0	200	41.8	4.6	56.0	2.00	400	.093	.154	.67	0.0
Bread, white, unenriched	4 slices	120.0	300	61.3	10.5	69.0	.93	trace	.057	.117	.72	0.0
Butter	2 tablespoons	26.0	200	0.0	.2	4.0	.06	1100	.000	.000	.00	0.0

* Warmed over mashed potato. † Raw.

TABLE 40—(Continued)

Foods	Measure as served	Wt.	Cal.	Carb.	Pro.	Ca	Fe	Vitamins				
								A	B_1	Ribo-flavin	Niacin	C
		gm.		gm.	gm.	mg.	mg.	I.U.	mg.	mg.	mg.	mg.
Milk, pasteurized	1 cup	244.0	170	12.0	8.1	291.0	.60	470	.110	.531	.26	3.6
Apple sauce	½ cup	139.8	150	42.2	.6	11.1	.36	101	.038	.042	.06	6.0
Cookies	2, 2¼" diam.	28.0	100	14.0	1.4	4.0	.10	200	.012	.018	.15	0.0
Totals			3182	469.0	94.6	1013.9	15.32	5655	1.160	2.339	14.22	25.0
National Research Council Standard†			3200		85.0	1400.0	15.00	5000	1.600	2.400	16.00	90.0
Difference			−18		+9.6	−386.1	+.32	+655	−.440	−.061	−1.78	−65.0
Above diet + 1 cup tomato juice			3242	477.5	97.0	1028.9	16.82	7785	1.390	2.464	16.10	83.0
Above diet with 1 cup tomato juice and enriched bread			3242	477.5	97.0	1028.9	22.82	7785	1.964	3.199	23.30	83.0
Above diet with 1 cup tomato juice, 6 slices of enriched bread (instead of 10), and 1 additional pint of milk			3282	440.0	102.7	1541.9	21.62	8725	1.900	3.967	20.94	90.2

† Committee on Food and Nutrition, 1941.

By retaining the tomato juice, reducing the enriched bread from 10 to 6 slices, and adding 1 pint of milk the diet could be made to meet the standards for all of the indicated constituents. The reduction in bread and the addition of the extra pint of milk would bring down the carbohydrate from 58.9 to 53.6 per cent of the total calories and would also supply additional high quality protein, fat, vitamins (especially riboflavin), and minerals including calcium.

The above typical diet would have a slightly alkaline reaction in the body (owing especially to the large amount of potato) and therefore would tend to cause the secretion of a saliva with relatively high acid neutralizing power. The writer considers this to be important from the standpoint of the protection of the teeth against the destructive effect of acids produced by the fermentation of sugars in the mouth. However, the high carbohydrate content of the diet would tend to counteract the potential protective effect of the saliva since it would favor high acid production. (Becks, Jensen and Millar, 1944).

The addition of the tomato juice and milk to the typical diet would make it even more alkaline in reaction in the body, since these foods have a basic ash. With its high potential alkalinity, decreased carbohydrate content, and liberal supply of minerals and vitamins the improved diet could be expected to give much better protection to the teeth than the typical diet. However, in order to give the best dietary protection against dental caries it would probably be necessary to give vitamin D and to restrict the consumption of candy and other sweets (McBeath and Zucker, 1938) (Koehne et al., 1934).

The food value of the above diet was calculated mostly from tables given by Taylor (1942), Macleod and Taylor (1944), Bowes and Church (1939), Chaney and Ahlborn (1939), Clouse (1943), and the Committee on Food Composition of the Food and Nutrition Board of the National Research Council (1944). The figures given for mineral and vitamin content are necessarily only estimates, owing to natural variations in different foods in the raw state and to variations which result from the methods of cooking and canning used.

HEALTH HABITS

Sleep and activity. Questions answered by the Newport mothers regarding hour of retiring, hour of rising, and work outside of school hours indicated that the majority of the children were probably getting enough sleep and were not overworked. Nearly all appeared to be getting a desirable amount of outdoor play and exercise.

Use of laxatives. Irregularities in bowel movement were quite common in Newport, as well as in the other three towns, and the use of laxatives was reported as frequent. Information regarding their use is given in Tables 41 and 42. It will be seen that 61.7 per cent of the Newport children received them at various time intervals. The Mars Hill children showed the highest frequency in the use of laxatives and the Monmouth children the lowest.

TABLE 41

Frequency in the Use of Laxatives

Town	No. of children in group	No. using laxatives	Per cent using laxatives	1/week Per cent	2/week Per cent	1 or 2/week Per cent	3/week Per cent	Daily Per cent	Occasionally Per cent
Newport	240	146	61.7	10.0	5.0	1.7	.8	.8	42.5
Mars Hill	146	73	50.0	21.2	2.7	.7	2.7	2.1	20.6
Jonesport	141	57	40.4	16.3	2.8	6.4	1.4	.7	12.8
Monmouth	128	54	42.2	9.4	1.6	1.6	2.3	.8	26.6

TABLE 42

Percentage of Children Using Various Kinds of Laxatives

Town	No. of children in group	Ex-Lax	True's Elixir	Cascara Sagrada	Castoria	Castor Oil	Agars	Sennas	Mineral Oil	Doctor's prescription	All others
Newport	240	18.8	16.7	.8	3.3	10.4	.4	0.0	5.0	.4	18.8
Mars Hill	146	21.9	3.4	0.0	4.1	2.1	2.1	2.1	1.4	.7	21.9
Jonesport	141	17.0	12.1	0.0	.7	.7	.7	.7	.7	2.8	16.3
Monmouth	128	.8	8.6	7.0	3.9	3.9	2.3	0.0	3.1	0.0	18.8

Causes of constipation in children. According to Aaron (1938, p. 145) the occurrence of constipation in children may be due to several causes, among which are organic disease, wrong type of diet, nervousness caused by wrong attitude of parents, and the use of too many laxatives.

The type of diet which tends to promote constipation is one which is common in Maine and which is low in fruits,[20] vegetables, and whole grain cereals. These foods supply fiber, organic acids, sugars, salts, and vitamin B_1, each of which plays a part in the normal functioning of the alimentary tract. Fine grinding and thorough cooking of whole grain cereals tend to prevent the bran from being too irritating to the intestinal tract.

Robertson (1937) has found that both potassium and calcium are necessary to prevent intestinal stasis. Therefore, milk, which supplies calcium and which also tends to be low in Maine diets, may also be important in preventing constipation rather than causing it, as some people believe. Potassium is supplied especially by vegetables and whole grain cereals.

With regard to the attitude of parents upon the frequency of constipation in children, Aaron (1938) states that parents who worry excessively about the occurrence of constipation in themselves are apt to stress regularity in their children to an unreasonable degree. Laxatives are given when unnecessary, with the result that constipation is often actually caused by irritation of the lining of the colon and changes in the muscular coat. The giving of too many laxatives may also cause malnutrition by causing the food to pass through the intestine too rapidly.

Kinds of laxatives used. A wide variety of laxatives was used in the different towns, but, as shown in Table 42, certain kinds were used much more than others.

Ex-Lax was the kind most used in Newport, Mars Hill, and Jonesport. This contains the drug phenolphthalein which acts as an irritant to both small intestine and colon. According to Aaron (1938, p. 126) it has been responsible for marked stomach and intestinal disturbances and in sensitive persons has caused ulcers in the mouth and skin eruptions. He states that the drug and products containing it should be avoided.

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[20] The lower frequency with which laxatives were regularly used in Monmouth may be related to the more frequent use of apples in that town.

In Newport, Jonesport and Monmouth *True's Elixir* was given to a considerable number of children. This preparation contains senna and aloin. These are irritant drugs which act chiefly on the colon (Wood and Osol, 1943).

Cascara Sagrada was used by 7 per cent of the Monmouth children. This is a useful drug for treating certain types of occasional and habitual constipation in adults but Aaron does not recommend it for children. Its action is on the colon. Many proprietary laxatives contain it.

Senna is also an ingredient of *Caldwell's Syrup of Pepsin* and *Castoria*. According to Aaron (1938, p. 125) this drug is more powerful than cascara sagrada and it may produce griping and considerable irritation. Therefore it is unsuitable for children.

Castor oil was used by 10.4 per cent of the Newport children. Since the action of both castor oil and calomel is quite drastic they should never be used except on the advice of a physician.

Agar is considered by Aaron (1938, p. 111) as the best of the bulk producing laxatives. It is best taken in the granular form with water. This laxative is, however, better suited to adults than to children.

Mineral oil, which was used by 5 per cent of the Newport children and 3 per cent of those in Monmouth, is a good softening and lubricating agent. However, since it acts as a solvent for the fat soluble vitamins, its frequent use is objectionable.

Milk of magnesia is considered a good laxative for children when one seems necessary, but, as previously stated, this should be very seldom.

Other habits. The mothers in all four towns were questioned regarding the occurrence of such habits as enuresis, thumb sucking, and nail biting in the children. Enuresis and thumb sucking were not very prevalent but constant nail biting (or picking) was quite common in all four towns. According to Griffith and Mitchell (1934, p. 891) this habit is observed only in decidedly nervous children.

Illnesses and Operations

Table 43 gives information regarding the number of children in the different towns who had had various diseases and operations.

TABLE 43

Number of Children Reported as Having Had Various Diseases and Operations

Total No. records	Newport 1937–38	Mars Hill 1934–35	Jonesport 1934–35	Monmouth 1934–35
	234	141	173	167
Contagious or infectious				
Chicken pox	122	108	95	88
Conjunctivitis	4	3	0	0
Diphtheria	1	0	0	0
Infantile paralysis	1	0	0	1
Influenza	9*	3	10	8
Impetigo	4	0	0	0
Measles, Germ. measles or both	201	96	116	83
Mumps	119	62	63	31
Pneumonia	23	14	14	16
Rheumatic fever	0	2	1	0
Scabies	4	0	0	0
Scarletina	4	3	0	0
Scarlet fever	15	14	8	44
Tuberculosis	0	1	0	0
Typhoid	1	3	1	0
Whooping cough	172	114	144	121
Nervous diseases				
Chorea	0	0	0	2
Convulsions	0	1	2	4
Other diseases				
Abscesses	4	1	2	0
Anemia	6	1	0	1
Appendicitis	4	3	2	3
Asthma	1	0	0	1
Bladder infection	0	0	1	0
Blood poisoning	0	0	0	1
Bronchitis	3	2	4	0
Diabetes	2	1	0	0
Digestive disorders	30	4	2	2
Eczema	1	1	0	0
Infected glands	1	0	0	4
Jaundice	1	4	2	0
Nose bleed	3	0	1	0
Otitis	18	1	2	2
Psoriasis	1	0	0	0
Quinsy	0	0	2	0
Rheumatism	0	0	0	2
Rickets	1	1	0	1
Scurvy	0	1	0	0
Stomatitis	2	0	0	0
Tonsillitis	2	3	3	1
Worms	8†	0	0	0

* Includes 5 cases of intestinal flu.

† Includes 2 cases of tapeworm.

TABLE 43—(Continued)

Total No. records	Newport 1937–38	Mars Hill 1934–35	Jonesport 1934–35	Monmouth 1934–35
	234	141	173	167
Operations				
Appendectomy	8	3	1	2
Circumcision	9	5	2	6
Club foot	1	0	0	0
Cords of heel	0	1	0	0
Cords of neck	0	1	0	0
Eye	0	1	0	2
Glands of neck	0	1	0	1
Hernia	0	1	0	3
Hip manipulation	0	0	0	1
Kidney stones	1	0	0	0
Mastoid	0	0	0	3
Osteomyelitis	1	0	0	0
Rupture	1	0	0	0
Tonsils and adenoids	55	22	15	30
Tumor	2	0	0	0

In some cases the numbers may be low, due to the fact that the mothers forgot to mention certain illnesses.

Illnesses. Among the contagious and infectious diseases listed as affecting the greatest number of children were whooping cough, measles, chicken pox, mumps, pneumonia, and scarlet fever. The number of cases of scarlet fever was especially high in Monmouth. There were no cases of smallpox, only one of diphtheria, and two of infantile paralysis.

Among the other diseases those often mentioned were abscesses, anemia, appendicitis, bronchitis, digestive disorders, jaundice, otitis, and worms. Digestive disorders and otitis were especially frequent in Newport. It is of interest that although the school examinations of the children showed that anemia and evidence of early rickets were quite common, the mothers were apparently unaware of the existence of these conditions. Also, even though a significant number of the children showed inflamed gums, the condition had apparently been noticed by very few of the parents and had been related to a deficiency of vitamin C by none of them.

Operations. By far the most common operation which the children had had was tonsillectomy and adenoidectomy and a considerable number of others were badly in need of the operation.

The next most frequent operations were appendectomy and circumcision.

Immunizations. Answers regarding immunization treatment for prevention of such diseases as smallpox, diphtheria, scarlet fever, typhoid fever, whooping cough, etc., showed that Monmouth was the only town where a significant number of vaccinations against smallpox had been made (30 per cent of the group). None of the Jonesport children had been vaccinated and only 3 per cent of the Mars Hill children and 4 per cent of those in Newport.

In Newport, under the auspices of the Parent Teachers Association, the majority of the children were vaccinated against diphtheria by the State Department of Health. This work was begun in the spring of 1938 and continued in the fall of 1939. However, at the time the home visits were made, only 3 per cent of the group had been vaccinated against diphtheria. Also 3 per cent had been vaccinated against whooping cough.

DISCUSSION

The findings of this study indicate that many of the outstanding health problems of Maine grade-school children are closely related to nutrition. The most serious of these problems are: dental caries, a tendency to retarded bone growth, the prevalence of bone defects resulting from rickets, and the prevalence of inflamed gums resulting from vitamin C deficiency.

The problem of dental caries is the most complex of all, since so many factors may be directly or indirectly responsible for the condition. As is generally well known, the immediate cause of caries is the action on the teeth of acids produced by bacterial action on sugars present in the mouth. The part which nutrition can play in the prevention of caries is, first of all, the provision during the period of tooth and jaw development, of all of the dietary constituents needed for building well-developed jaws and well-formed and adequately spaced teeth. Among the dietary constituents of special importance are calcium, phosphorus, magnesium, traces of fluorine (See p. 175), and vitamins A, C, and D.

Following the eruption of the teeth nutrition is especially important in its effect on the composition of the saliva. Whether

or not erupted teeth can be influenced through the blood stream is still an unsettled question. Since dental caries is caused by the action of acids, a saliva having a high titratable alkalinity tends to neutralize these acids and thus protects the teeth to the extent that it reaches those parts of the mouth where the acid is being produced. (See p. 176 for a discussion of the effect of fluoride in reducing the solubility of tooth enamel.) When the jaws are well developed and the teeth evenly placed (and kept reasonably clean) the saliva has a much better opportunity to reach all of the tooth surfaces than when malocclusion is present. Thus the normal development of the jaws and teeth is of primary importance. Many different factors affect the acid base balance of the body but it is well known that foods play a very important part in maintaining the normal pH of the body cells and fluids. The following foods, which have an alkaline reaction in the body, tend to produce an alkaline saliva: milk, fruits (except cranberries and prunes), and vegetables (except corn). Cereals, meat, and eggs have an acid reaction in the body and tend to produce an acid saliva.

The diets of Maine grade-school children tend to be high in acid-forming foods, especially refined cereal products, and especially low in base-forming foods such as milk, fruits, and vegetables (except potato). Also before bread and flour were enriched, many of the diets were low in thiamin. Without sufficient thiamin, carbohydrate cannot be completely metabolized in the body and lactic and pyruvic acids accumulate in the blood (Chestler et al., 1944), lowering the alkaline reserve. This condition would also tend to produce an acid saliva. The use of enriched bread, whole grain products, and pork should correct any wide-spread deficiency of this vitamin.

Since the acids formed in the mouth are produced from carbohydrates, one way to limit their production is to limit the consumption of carbohydrate. Dr. J. D. Boyd, of the State University of Iowa, (1942) states that the child's diet which he has found effective in the prevention of caries contains about half of the calories in the form of carbohydrate and about one-third in the form of fat.[21] This division of calories is similar to that mentioned by Chaney and Ahlborn (1939). (See footnote 18, p. 164.)

[21] This diet includes daily the following foods: 1 quart milk; 1 or 2 eggs; 2 four-ounce servings succulent, leafy, and root vegetables; 2 four-ounce servings fruit, one of which should be orange or other raw fruit (tomato

Potatoes, bread, other cereal products, and sugars are the chief sources of carbohydrate in the diet. Since potatoes are base forming in the body their liberal use as a partial substitute for bread and cereals, makes it easier to prevent an overbalance of acid-forming foods and yet to supply the necessary amount of carbohydrate.

Vitamin D in the form of cod liver oil (or a vitamin D concentrate) has been found to assist in the prevention of dental caries (McBeath and Zucker, 1938). Just how it functions in accomplishing this is not known, but it appears to increase the absorption of calcium and phosphorus from the intestine and thus increases the calcium and phosphorus content of the body fluids, including the saliva. As pointed out by Jeans and Stearns (1938), Sherman (1941), and others, vitamin D cannot function unless adequate calcium (and phosphorus) is available. In some parts of the United States considerable amounts of calcium are available from drinking water and from fruits and vegetables grown in the soil of the particular locality. Dove (1934) has called attention to the fact that the surface waters and soil of Maine are low in calcium. Therefore, it is probable that Maine people secure a relatively small proportion of their needed calcium from their drinking water or foods[22] other than milk. Since the calcium content of cow's milk is high and quite uniform, irrespective of the diet of the cow (Sherman, 1941), this food is the most reliable source of calcium in the diet.

Within recent years there has been a great deal of discussion in the scientific literature regarding the effect of fluorides on the

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may be used as a substitute); 1 serving meat, fish, fowl, or liver; 1 teaspoon cod liver oil; and supplementary foods such as potatoes, starches, bread and other cereal products, sweets and fats, in amounts to complete the caloric requirements for full activity.

In a recent paper Boyd (1944) reported the results of studies on diabetic children which indicated that when the diets were high in protective factors certain changes in the proportion of fat and carbohydrate made no difference in the susceptibility of the children to dental caries. However, Boyd's high fat diet contained only 14% of the total calories in the form of carbohydrate and the low fat diet only 32% in the form of carbohydrate.

[22] In the production of vegetable and grain crops in Maine calcium is ordinarily added to the soil in the form of powdered limestone. However, the amount of calcium taken up by growing plants is small compared to the amount in milk.

teeth. A high concentration of fluoride in drinking water (from slightly over 1 to 2 parts per million) causes mottled enamel (Smith, Lantz, and Smith, 1931), while a concentration of 1 part per million produces very little mottled enamel and gives marked protection against caries (Dean et al., 1941). This protective effect appears to be greatest during the period of tooth development. Drinking water in several parts of Maine has been shown by the Division of Sanitary Engineering of the State Department of Health and Welfare to be very low in fluorides. Therefore, at some future time dental caries may be reduced in the State by the carefully supervised addition of small amounts of sodium fluoride to public water supplies. However, owing to the possible toxic effects of fluorides, this will probably not be done until further surveys are made regarding the effects of varying amounts of naturally occurring fluorides and fluoride additions on the teeth and general health of selected groups of people.

Another possibility for the reduction of caries has been suggested by the results of recent experiments on the application of dilute fluoride solutions to the surfaces of the teeth. Dr. B. G. Biddy (1942) of Tufts College Dental School applied a 1-1000 solution of sodium fluoride to the teeth (in one quadrant of the mouth) of a group of 78 children over a period of two years and secured a distinct reduction of caries in the treated teeth. Similar results have been secured by other workers (Cheyne and Rice, 1942; Knutson and Armstrong, 1943). The fluoride is apparently absorbed by the tooth enamel, which becomes less soluble in an acid solution (Volker, 1943).

In some parts of the United States fluorides are present in the soil and are taken up in small amounts by growing plants which are used as food for both humans and animals. It seems probable, however, that in Maine, where the surface waters have been found to be low in fluorides, the soil would also be low. No analyses for the fluoride content of Maine foods have as yet been made.

Bone deformities produced by rickets and undersized bones are the types of bone defects which are evident in Maine grade-school children. It seems probable that these could be prevented by the adequate consumption of calcium, phosphorus, and vitamin D during pregnancy, infancy, and childhood. While vitamin C also is known to be necessary for normal bone structure, no

evidence of bone defects due to a deficiency of vitamin C was obtained in this study.

The prevalence of vitamin C deficiency, as indicated by inflammation of the gums, indicates that the problem of providing foods high in vitamin C for all Maine people at all times of the year is one of great importance. Potatoes, which are consumed in considerable quantity, contain significant amounts of vitamin C when dug, but during storage at 38° F. for 6 months lose approximately 40 per cent of their vitamin C content. (Fellers, 1942.) Thus, Fellers reports that Green Mountain potatoes, raised in Massachusetts, contained 16.7 mg. per 100 gms. when dug and 10 mg. after 6 months in storage at 38° F. Some methods of cooking conserve the vitamin much better than others. For instance, Fellers secured a value of 7.3 mg. per 100 gms. for potatoes (after 6 months in storage) boiled whole in the skin (in salted water). The same potatoes baked gave a value of 6.9 mg.; French fried 6.7 mg. and boiled, peeled, in salted water 5.5 mg. Other common methods of cooking gave still lower values and warmed over potatoes and potato salad contained practically no vitamin C. In November, 1939, the writer (Clayton and Folsom, 1940) secured average values of 14.9 mg. per 100 gms. for baked Green Mountain potatoes raised in Maine but there is no doubt that lower values would have been secured later in the season.

Dove and Murphy (1943) reported high values for a number of varieties of Maine potatoes, including Katahdin and Sebago. However, these values were obtained soon after digging. According to Fellers (1942) storage seems to cause a leveling off of the differences between varieties in vitamin C content. The question of the effect of storage is being investigated further at the Maine Station. (See Bul. 426 pp. 304-305.)

The above data indicate that, if properly cooked, potatoes can be a very good source of vitamin C early in the winter. However, since loss in storage is so high, other vitamin C containing foods must be relied on to a great extent, especially during the late winter.

The data presented in this study indicate that apples are the fruit consumed most by grade-school children in the towns where surveys were made. The favorite variety of apples for eating raw appears to be the McIntosh. Unfortunately, this apple, which grows well in Maine climate, is very low in vitamin C. Murphy

and Dove (1943) published a list of eleven varieties of Maine-grown apples, all of which (very soon after harvesting) gave vitamin C values in excess of 16 mg. per 100 gms. These included the following early and late varieties (Comments by Professor J. H. Waring of the Department of Horticulture, University of Maine):

Early

Red Duchess.	A red strain of the old variety, Duchess of Oldenburg. Season: latter half of August. Hardy, attractive, an excellent cooker, well established and adapted to the Maine climate. Available commercially to a limited extent but not abundant at present.
Red Astrachan.	Season: August. Excellent for home and early market. Very hardy. More common in Maine orchards at present than Duchess and Red Duchess.
Early Harvest.	Season: early to mid-August. Very little grown in Maine. The variety is not very hardy but should grow successfully in southern and western Maine.

Late

Northern Spy	Excellent late winter variety. Still planted to quite an extent. Bitter pit susceptibility and slowness in beginning to bear fruit discourages growers from more extensive planting. The variety is not sufficiently hardy to be successfully grown in central and northern Maine.
Russet.	Both Golden and Roxbury Russets are old, late, excellent keeping varieties, but no longer much planted in Maine. They might well be used more extensively in home orchards.

According to Wolf (1942) loss in storage varies greatly with different varieties. In Wolf's study the average percentage loss during prolonged storage at 2.5° C was 50. Studies of losses of vitamin C in cooking apples indicate that in making apple sauce from peeled apples about 25 per cent of the vitamin is lost. Much

higher percentages are lost in the baking of apples and in making apple pie (Curran, Tressler, and King, 1937).

These findings seem to indicate that if varieties of apples high in vitamin C could be raised to a greater extent in Maine the early varieties, if eaten raw, could be a very good source of vitamin C during the fall months when citrus fruits are expensive. Owing to storage losses, the later varieties, even though eaten raw during the winter, could be counted on as supplying only a small fraction of the vitamin C required for good nutrition.

Fresh and canned tomatoes and tomato juice have long been considered excellent winter sources of vitamin C but, judging from work done at the Maine Agricultural Experiment Station and elsewhere, there is a great difference in the vitamin C content of different varieties of tomatoes and the products made from them. Also, as shown by Murphy (1942) and others, there may be a difference in the same variety of tomato at different seasons and in different years. However, the tendency of a particular variety to be high or low in vitamin C persists from year to year. Murphy and Monroe (1943) showed that differences in the vitamin C content of two varieties of raw tomatoes (Farthest North A and Farthest North C) persisted after the tomatoes were canned and that products made from the variety low in vitamin C lost their vitamin at a higher percentage rate than those made from the variety high in the vitamin.

Tomato juice canned in tin retains its vitamin C better than that canned in glass (Daniel and Rutherford, 1936; Hauck, 1943; and others). The following average results, secured this year in the writer's laboratory, give an example of the loss in vitamin C which can be expected when glass jars of tomato juice are stored at room temperature:

Variety: Farthest North C[23]
Vitamin C content of raw tomatoes: 23.5 mg. per 100 gms.
Vitamin C content of canned juice after 1 month storage: 20.1 mg. per 100 gms.; after 3 months, 15.2 mg.; after 6 months, 12.8 mg.

The effect of storage temperature on the retention of vitamin C in canned tomato products has not been studied, but judging from the results of a recent study on canned citrus fruits (Ross,

[23] Similar results were secured for canned Farthest North C tomatoes.

1944), the vitamin C in canned tomato products would be retained much better in a cool cellar (50-60° F.) than at room temperature.

The above findings indicate that if canned tomatoes or juice are relied on as the chief source of vitamin C in the diet, the amounts consumed in the late winter should be double those consumed in the fall. Also, particularly when tomatoes are raised for home consumption, special consideration should be given to the choice of varieties known to be high in vitamin C. Early varieties shown by Murphy[24] (1942 and personal communication) to be high in vitamin C when grown in Maine are: Farthest North C, Comet, Early Trellis, Best of All, and Waltham Forcing. The Farthest North C tomatoes are small in size but are early and especially good for making tomato juice. The other varieties are considerably larger. Bonny Best, Stokesdale and Pritchard, three varieties popular in Maine, are comparatively low in vitamin C. (Clayton, 1944, unpublished data.)

Spinach, fresh, cooked, and canned, is an excellent source of vitamin C. An important characteristic of canned spinach is that it does not lose its vitamin C on storage. This year, in the writer's laboratory, a value of 33 mg. per 100 gms. was secured for canned Nobel spinach after 8 months at room temperature. In canning this spinach the stems were removed and all of the blanching water used in filling the tin cans.

Canned rutabaga greens were also found to be high in vitamin C, although the effect of storage on the vitamin C content has not yet been studied. Rutabaga roots are also an excellent source and retain the vitamin very well in cellar storage.

The above comments indicate that there are a number of factors which affect the vitamin C content of foods as they are eaten. In order to insure an adequate intake of vitamin C throughout the year, Maine families should either make regular use of fresh or canned citrus fruits and juices or a combination of these together with some of the following, according to the season:

Apples, raw. For varieties see above list and comments.

Broccoli (fresh or frozen), raw and cooked (cut in small pieces and cooked in a small amount of water or left in large pieces and steamed or cooked in a larger amount of water).

[24] Elizabeth F. Murphy, Assistant Biologist, Maine Agr. Expt. Sta.

Brussels sprouts (freshly picked or frozen), cooked (in a small amount of water).

Cabbage, raw and cooked (shredded and cooked in a small amount of water or panned using a small amount of fat).

Cantaloupe, raw.

Cauliflower (fresh or frozen), raw and cooked (see broccoli).

Escarole, raw.

Green beans (freshly picked or frozen), cooked in a small amount of water.

Green pepper, raw.

Kale, raw or cooked (small curls, steamed or cooked in a small amount of water).

Kohlrabi (freshly picked), cooked.

Lettuce, raw (large serving).

Mustard greens (freshly picked), cooked (in a very small amount of water) or canned (using all of the blanching water to fill cans).

Onions, raw (not soaked in vinegar).

Parsnips (higher in vitamin C in the fall), cooked (sliced or left whole, in a small amount of water).

Peas (freshly picked or frozen), cooked (in a small amount of water).

Radishes, raw.

Raspberries, raw.

Rose hips, made into jelly or jam. (Hips from Rosa Rugosa are especially high in vitamin C.)

Rutabagas, raw and cooked (steamed or cooked in a small amount of water).

Rutabaga or turnip greens, cooked (in a very small amount of water and flavored with a little bacon or salt pork) or canned (using the blanching water to fill cans).

Spinach, raw, cooked (with only the water which clings to the leaves), and canned (leaves only, using the blanching water to fill the cans).

Strawberries (fresh or frozen), raw or canned in a medium syrup.

Tomatoes and tomato juice, raw (in season) and canned (canned tomatoes and green peppers mixed are especially high in vitamin C). For varieties see above list and comments.

SUMMARY

Physical examinations of approximately 220 Newport grade-school children, made fall and spring each year for four years (1936-40), showed the following:

1. Bone defects were very common, many of which were apparently the result of rickets in infancy. Similar defects were seen in the other three towns where surveys were made (Mars Hill, Jonesport, and Monmouth).

2. In the spring of 1937, 72.9 per cent of the Newport children and 63.9 per cent of those in Mars Hill were rated as having good nutrition. In the spring of the next three successive years approximately 81 per cent of the Newport children were rated "good." In these ratings the condition of the teeth and gums and other defects not plainly visible were not considered.

3. Approximately one-third of the Newport children (spring averages 1937-40) and one-half of the Mars Hill children (spring 1937) were more than 6 per cent underweight by the McCloy standards. More girls than boys were underweight.

4. Approximately 4 per cent of the Newport children had enlarged thyroid glands. Similar findings were secured in Monmouth and Jonesport. There were fewer cases in Mars Hill.

5. Newport children, as well as those in the other three towns, were particularly subject to colds, which were often accompanied by earache, tonsillitis, and enlarged cervical glands. Digestive upsets and toothache were also frequently reported.

Physical measurements, made in Newport (1936-40) and in Mars Hill in 1936-37, included height and weight and 12 other measurements needed for determining the McCloy weight, fat, and limb girth indices. Comparisons of height and weight averages for all four towns showed the following:

HEIGHT

1. The fall height averages for the Newport girls showed no significant differences in the different years (1936-40). The spring averages were highest in 1939 and lowest in 1937; the differences between averages for these two years were highly significant.

2. The fall and spring height averages for the Newport boys showed no significant differences in the different years.

3. The 4-year fall height averages for the Newport girls were higher than those for the girls in the other three towns. The differences between the Newport and Jonesport averages were highly significant.

4. There were no significant differences between the 4-year fall height averages for the Newport boys and the 3-year fall averages for the Mars Hill boys, but the Newport boys tended to be taller than those in the other two towns. The differences between the Newport and Jonesport averages were highly significant and those between Newport and Monmouth significant.

5. The Mars Hill and Jonesport girls and the Jonesport boys tended to be shorter than public school children in other parts of the United States. The groups measured in all four towns were significantly shorter than the Iowa City children studied by Meredith and Boynton and the private school children studied by Gray and Ayres.

WEIGHT

1. The average fall weights of the Newport girls were significantly higher in 1939 than in 1937. The spring averages in the different years showed no significant differences.

2. There were no significant differences between either the average fall or the average spring weights of the Newport boys in the different years.

3. The 4-year fall weight averages for the Newport girls were not significantly different from the averages for the girls in the other three towns. However, the averages for the Mars Hill and Monmouth girls were significantly higher than those for the Jonesport girls.

4. The 4-year fall weight averages for the Newport boys were significantly higher than those for the Mars Hill boys. The differences between the Mars Hill, Jonesport, and Monmouth averages were not significant.

5. The fall weight averages for the Newport and Jonesport girls were significantly lower than the U. S. averages but the fall averages for the boys in each of the four towns showed no significant differences from the U. S. averages. In comparison with the Iowa and Gray's averages the differences for both girls and boys in all four towns were highly significant, the Maine averages being lower.

TYPE OF BUILD

1. Comparisons of the average height for weight, height for chest circumference (xiphoid level), and height for bi-iliac hip width of the Newport children with the Iowa City children studied by Meredith and Boynton showed that the Newport and Iowa children were proportioned about the same but that the Newport children were smaller for their age.

THE MCCLOY METHOD FOR DETERMINING NORMAL WEIGHT AND THE MCCLOY WEIGHT, FAT, AND LIMB GIRTH INDICES

1. The McCloy weight standards, based on 8 physical measurements, were found very satisfactory for children of average build. They appeared somewhat high for overweight subjects and somewhat low for those who were extremely underweight.

2. High correlations were obtained between the McCloy weight and fat indices and estimates of nutrition made by the writer. Correlations between limb girth indices and nutrition estimates were low.

PHYSICAL CHANGES DURING ADOLESCENCE

1. The attainment of maturity in the Newport girls was accompanied by a gain in height of about 16 per cent from age 9. In the boys there was a similar percentage gain from age 11.

Dental examinations of the Newport children, made each fall for the four years (1936-40), showed the following:

1. The average number of cavities in the deciduous teeth (for the four years) was 5. The fall 1936 average was slightly lower than that for Mars Hill, but similar to those for Jonesport and Monmouth.

2. The average number of cavities in the permanent teeth (for the four years) was 4.8. The Newport average for fall 1936 was somewhat lower than those for the other three towns in 1934, but the differences may have been partly due to the difference in examiners.

3. Very few fillings were found in the deciduous teeth, the four-year average being only .42.

4. The average number of fillings in the permanent teeth (for the four years) was 1.28. This average is low in proportion to the number of cavities.

5. The permanent teeth most frequently extracted in the Newport children were the six-year molars. The four-year average for all permanent teeth extracted was .19.

6. In Newport 91.2 per cent of the children had one or more carious, filled, or extracted six-year molars. This figure is somewhat higher than those secured in the other three Maine towns.

7. More children with no caries, fillings, or extractions were found in Newport than in any of the other three towns, the four-year average being 3.6 per cent.

8. Irregular occlusion was the most common type of malocclusion seen in all four towns, but upper protrusion was also very common.

9. Only 2.7 per cent of the Newport children showed hypoplastic enamel in either their deciduous or permanent teeth.

10. In the Newport children gum inflammation was seen more frequently in the spring than in the fall. The fall and spring group averages for the last three years of the study were 11.8 and 24.4 per cent.

11. Six-hour vitamin C saturation tests and curative tests showed that in the majority of the children gum inflammation was related to vitamin C deficiency.

Home visits in Newport were made in the late fall and early winter of 1937. Data were secured regarding the family history, home conditions, and early history of the children as well as their diets and health habits at the time of the visits.

1. Fresh milk consumption in Newport was only a little more than half of that which is considered desirable for good nutrition. The average consumption per person in families with cows was .67 quart; in families without cows it was .37 quart. The average milk consumption of Newport families without cows was similar to the Monmouth average and somewhat higher than the Mars Hill and Jonesport averages.

2. Approximately 80 per cent of the Newport families had gardens but only 16 per cent had chickens. Newport was lower than Mars Hill or Monmouth in the percentage of families having gardens and lower than any of the other three towns in the percentage having chickens.

3. Apples were the chief fruit, exclusive of berries, raised in the four towns where surveys were made. In Monmouth a considerable number of families also raised pears, plums, cherries, and grapes.

4. Berries were the kind of fruit canned by the most families in all four towns.

5. The vegetables canned by the most families were string beans, pickles, greens, beets, and peas. Only about 9 per cent of the Jonesport families and 32 per cent of the Mars Hill families canned tomatoes. They were more frequently canned in the other two towns.

6. The quantities of fruits and vegetables canned by the majority of housewives were not sufficient to supply their families throughout the winter.

7. Apples, beets, cabbage, carrots, potatoes, rutabagas, and squash were the chief foods stored in all four towns.

8. Approximately three-fourths of the diets of the mothers in all towns were probably inadequate during pregnancy. Lack of sufficient milk and vitamin D were the most evident dietary deficiencies.

9. Approximately one-third of the Newport children were breast fed 5 months or more. There were more breast fed babies in the other towns.

10. During their first year somewhat less than two-thirds of the children in all four towns had orange juice, tomato juice, or both. Between 17 per cent (Jonesport) and 39 per cent (Newport) had cod liver oil. More of the Newport babies received eggs and vegetables than those in the other towns.

11. For preschool children in the four towns the averages for milk consumption were between two-thirds and three-fourths of the standard (1 quart). About one-fifth of the Newport children had cod liver oil, but the numbers were lower in the other towns.

12. At the time of the Newport home visits the diets of many of the children were low in milk, citrus fruits and tomatoes, green and yellow vegetables, other vegetables, and eggs. They tended to be high in refined carbohydrates (sugar and white flour) and low in calcium, iron, and vitamins A, B_1, riboflavin, niacin, C, and D. The dietary deficiencies in the other towns were similar to those in Newport.

Diet records kept by the Newport and Mars Hill children showed the same types of deficiencies which were indicated at the time of the home visits.

CONCLUSIONS

Efforts toward improving the nutritive condition of Maine people should be directed toward increasing food production and preservation and toward education in the choice of adequate diets. Special emphasis should be given to the importance of the increased use of milk, fruits, and vegetables (especially those high in vitamins A and C), eggs, and whole grain products. Also the importance of vitamin D (and milk), especially for women during pregnancy and lactation and for infants and children, should receive the special attention of parents, teachers, dentists, and physicians.

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APPENDIX

Form 1

MAINE AGRICULTURAL EXPERIMENT STATION

HOME ECONOMICS PROJECT NO. 5

PHYSICAL EXAMINATION

Name. Address		Birth Date School	Name of Parent or Guardian Occupation		Grade
Date			Nose Obstruction		
Age			Discharge		
General Appearance			Mouth Breathing		
Bone Development			Mouth Hygiene		
Cranium			Teeth, form		
Spine			Caries, temp		
Chest			Caries, perm		
Joints			missing, temp.		
Epiphyses			missing, perm		
Feet			approx.		
Legs			6 yr m.		
Posture			Gums		
Nutrition			Glands Tonsils		
Turgor			Adenoids		
Muscle Devel.			Thyroid		
Subcut Tissue			Ant. cerv.		
Skin color			Post. cerv.		
texture			Other		
lesions			Heart		
Mucous Memb			Lungs		
Scalp			Abdomen Masses		
Hair			Hernia		
Nails			Genitalia		
Eyes Vision			Cooperation		
Pupils			Vaccination Scar		
Reaction l & a			General Condition		
Musculature			Remarks		
Conjunctiva					
Lids					
Ears Hearing					
Discharge			Recommendations		
Drums (r)					
(l)					

Form 1 Reverse Side

MEASUREMENTS			SUMMARY	
Date				
Age				
Height				
Weight				
Girth, chest				
Girth, upper arm				
Girth, forearm				
Girth, thigh				
Girth, calf				
Hip width—iliac				
Hip width—trochanteric				
Elbow width				
Knee width				
Fat chest front				
Fat abdomen				
Fat, chest back				
Fat suprailiac				
Total fat				
Hip difference				
Breathing capacity				
Pubescence				
Weight index				
Limb girth index				
Fat index				
Breathing capacity index				
Index of build				
Haemoglobin				

KEY TO PHYSICAL EXAMINATIONS

Use check mark for good or normal wherever possible and indicate deviations by descriptive words.

General appearance: Good, fair, poor.
Bone development: Indicate any marked deviation from the normal size of skeleton.
- Cranium: Normal, bosses (parietal or frontal), other abnormalities.
- Spine: Normal, kyphosis, lordosis, scoliosis.
- Chest: Normal, flat, pigeon, funnel, beading of ribs, Harrison's groove.
- Joints: Normal, limber, stiff, deformities.
- Epiphyses: Normal, enlarged.
- Feet: Normal, flat, pronation, talipes, etc.
- Legs: Normal, bowing, knockknees.

Posture: Good, fair, poor. (For details refer to bone development.)
Nutrition:
- Turgor: Good, fair, poor.
- Muscle development: Good, fair, poor.
- Subcutaneous tissue: Abundant, average, scant.
- Skin:
  - Color: Fair, medium, dark. Clear, sallow, pale.
  - Texture: Rough, smooth, dry, oily.
  - Lesions: State type.
- Mucous membranes: Normal, pale, scars, ulcers.
- Scalp: Clean, dirty, scaling, dry, oily, pediculi.
- Hair: Normal, oily, dry.
- Nails: Normal, brittle, tough, ridged, scarred, spotted, nail biting.

Eyes:
- Vision: Right 20/ ; left 20/ . Indicate if child wears glasses.
- Pupils: Regular, irregular.
- Reaction to light and accommodation: Normal, abnormal (describe).
- Musculature: Normal, strabismus (internal or external).
- Conjunctiva: Clear, injected, discharge, scars.
- Lids: Normal, stys, granulations.

Ears:
- Hearing.
- Discharge.
- Drums: Right
  Left

Nose:
- Obstruction. Indicate if present.
- Discharge: Slight, moderate, profuse. Indicate if child has an acute cold.
- Mouth breathing. Indicate if present.
  " " apparently caused by adenoids.

Mouth:
- Hygiene: Good, fair, poor, very poor.
- Teeth: (See Form 2, Appendix, for form used in detailed dental examinations.)
  - Form: Normal, grooved, peg-shaped, enamel defects.
  - Caries, temp.: Number and description.
  - Caries, perm.: Number and description.
  - Missing, temp.: Number.
  - Missing, perm.: Number.
  - Approximation: Good, fair, poor.
  - Six-year molars: Describe condition.
- Gums: Normal, spongy, injected, ulcerated.

Glands:
- Tonsils: Normal, enlarged +, ++, +++, ++++, removed.
- Adenoids (hypertrophied tissue): Present, removed.
- Thyroid: Normal, enlarged.
- Anterior cervical: If enlarged describe.
- Posterior cervical: If enlarged describe.
- Other: Indicate and describe.

Heart: Normal; if abnormal describe as to rhythm, murmurs, etc.

Lungs: Normal; if abnormal describe.

Abdomen:
- Masses: Normal; if abnormal describe.
- Hernia: If present indicate type.

Genitalia: Normal; if abnormal describe.

Cooperation: Good, fair, poor.

Vaccination scar: Check if present.

General condition: Good, fair, poor.

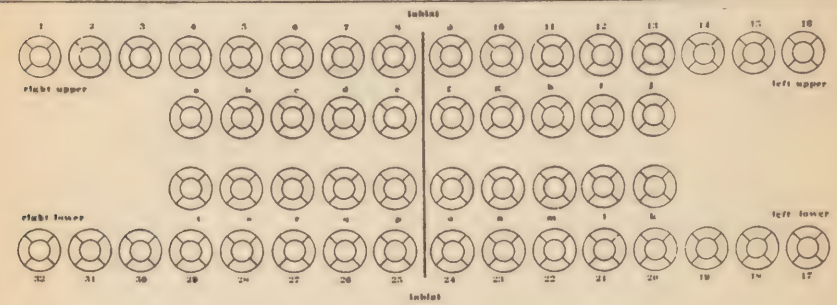
Remarks: Note here if mentality seems to be below average.

Form 2
Form 424

STATE DEPARTMENT OF HEALTH AND WELFARE
BUREAU OF HEALTH
DIVISION OF DENTAL HYGIENE
AUGUSTA, MAINE

(Name of Child) (Sex) (Birth Date)

(Name of Parent or Guardian) (Address of Parent or Guardian)



DA—Decalcified areas. S—Superficial caries. D—Deep caries. R—Retarded caries.
AB—Abscess. F—Filling. RR—Retained roots. G—Gingivitis. X—Extracted. FS—Fissure or pit

Date of Examination						
1. Type of Examination						
Tongue Depressor						
Mirror and Explorer						
2. Dental Care						
Regular						
Occasional						
None						
3. Home Care						
Regular						
Occasional						
None						
4. Oral Hygiene						
Good						
Fair						
Poor						
5. Occlusion						
Upper protrusion (Including overbite)						
Lower protrusion						
Cross bite						
Open bite						
Irregular						

(Over)

Form 2, Reverse Side Date of Examination						
6. Habits						
Thumb sucking						
Finger sucking						
Mouth breathing						
Lip biting						
Tongue biting						
Cheek biting						
Resting on hand						
Sleeping on hand						
Pacifier						
7. Mucous membrane						
8. Gum Tissue						
9. Anomalies						
10. Did prophylaxis precede examination?						
11. Temperament						
Phlegmatic						
Normal						
Nervous						
Remarks:						
Name of Examiner						

Directions Make all records with ink. Locate defect on tooth draw line to side and write symbol, adding number of examination, as—DA 1. Use check mark on items Nos. 1, 2, 3, 4, 5, 6, 7 and 11: write descriptive term in space opposite other items.

Form 3

MAINE AGRICULTURAL EXPERIMENT STATION

Home Economics Project No. 5 Home Visit

Name Birth date Date of visit
Address Newport school Grade

MEMBERS OF HOUSEHOLD	Name	Nationality	Age	Employment	Health*
Immediate family					
Father					
Mother					
Children (1.&d.)					
Other members					

*If dead give cause, age, and date

FAMILY HISTORY AND CONDITIONS IN THE HOME
Language spoken_____ Education of father_____ Mother_____
Type of house_____ Size_____ Care_____
FOOD PRODUCTION AND PRESERVATION FOR FAMILY USE
Cows_____ Other source of milk supply_____ Amount used daily_____
Vegetables raised or picked wild_____
_____
Fruits raised or picked wild_____
Hens_____ Young chickens_____ Animals for meat_____
Canning_____
Storage_____
PRENATAL HISTORY
Pregnancy: Physical condition_____ Employed?_____
Diet: Adequate____ Inadequate____ Deficiency of_____
Birth: Full term____ Overtime____ Premature__ Delivery: Normal____
Difficult____ Injuries or malformations_____ Blue baby____
Weight_____ General condition at birth_____
HISTORY OF FIRST YEAR
Basic feeding: Breast___ Duration____ Mixed___ Duration_____
Bottle___ Duration____ Kinds_____
Age at weaning_____ Month begun_____
Supplements: Orange juice
Tomato juice
Cod liver oil
Egg yolk
Vegetable pulp
Fruit pulp
Cereal
Meat broth
Other
Feeding problems_____
Health_____ Illnesses_____ Regular gain?_____
Dentition: Age of first tooth___ Regular____ Retarded_____

Form 3, Reverse Side

PRESCHOOL HISTORY

Diet: Were any foods particularly disliked?_____
Did any foods disagree?_____
Were any other foods withheld?_____
Amt. milk per day_____Cod liver oil_____Many sweets?____
Health_____Illnesses_____
Appetite: Good___Fair___Poor___Regular gain?_____

PRESENT FOOD AND HEALTH HABITS

Meals preceding day

Breakfast	Noon meal	Night meal	Between meals

Usual meals

Breakfast	Noon meal	Night meal	Between meals

Appetite: Good___Fair___Poor___Are breakfasts well eaten?_____
Have child's eating habits changed since he started to school?_____
Cooked veg. besides pot. eaten most_____
Tomatoes, how often?_____
Raw veg., how often?_____Kinds_____
Fruits eaten most_____
Oranges or grapef. how often?_____
Meat, how often?_____Fish_____Eggs_____
Cereals eaten most_____
Dark breads how often_____Kinds_____
Favorite desserts_____Candy, how often?_____
Amt. milk_____Cocoa_____Coffee_____Tea_____
Source of vit. D._____Seasons_____Amt. daily_____

Health habits: What time does child go to bed?_____
Regular about bed time?_____What time does he get up?_____
Lessons besides school work?_____What after school?_____

Laxatives?_____What?_____How often?_____Habits_____
Infectious diseases Severity Age

Other prolonged illnesses

Recent illnesses_____
Immunizations_____
Injuries_____
Operations_____
Physical defects_____

Form 4

NEWPORT FOOD RECORD - 1940

Name Age Birthday Grade

Parent's Name

Day	Date 1940	Foods	Amounts
		Breakfasts	
		Dinner	
		Supper	
		Between meals	

TABLE 9

Height of Maine Girls Included in This Study
Fall Averages for Four Towns Compared with U. S., Iowa, and Gray's Averages

Age†	1936–1939 (incl.) Newport		1934–1936 (incl.) Mars Hill		1934 Jonesport		1934 Monmouth		4 Maine Towns	U. S.	Iowa	Gray's
	No.	Av.	No.	Av.	No.	Av.	No.	Av.	Av.	Av.	Av.	Av.
		in.		in.		in.		in.	in.	in.	in.	in.
5	27	43.5	13	42.2	6	43.2	2	41.9	42.7	—	42.3	43.7
6	57	43.9	31	44.8	15	43.3	9	45.1	44.3	44.8	44.8	46.5
7	57	46.2	45	46.1	12	44.8	11	46.3	45.9	46.7	47.6	48.9
8	54	48.5	51	48.2	20	48.2	7	46.2	47.8	48.9	49.9	51.5
9	62	50.6	50	50.4	10	51.0	12	50.3	50.6	50.9	52.2	53.5
10	53	52.7	38	52.7	12	52.7	13	53.0	52.8	52.9	54.2	55.2
11	53	55.2	51	54.7	14	53.6	8	53.0	54.1	55.2	56.5	57.5
12	57	57.7	44	57.4	17	55.4	8	57.9	57.1	57.5	59.2	59.9
13	42	60.0	32	59.3	10	58.9	5	58.1	59.1	59.9	61.4	61.9
14	19	61.5	19	60.5	5	59.3	10	61.6	60.7	61.2	62.8	63.0

† To nearest birthday.

TABLE 10

Height of Maine Boys Included in This Study
Fall Averages for Four Towns Compared with U. S., Iowa, and Gray's Averages

Age†	1936–1939 (incl.) Newport		1934–1936 (incl.) Mars Hill		1934 Jonesport		1934 Monmouth		4 Maine Towns	U. S.	Iowa	Gray's
	No.	Av.	No.	Av.	No.	Av.	No.	Av.	Av.	Av.	Av.	Av.
		in.		in.		in.		in.	in.	in.	in.	in.
5	16	43.0	8	43.1	7	41.8	2	41.6	42.4	—	43.3	43.8
6	48	45.0	27	45.1	14	45.1	13	44.5	44.9	45.2	45.5	46.7
7	46	47.3	31	47.2	9	47.0	10	47.1	47.2	47.0	48.0	49.1
8	50	49.6	37	49.1	14	49.6	9	48.2	49.1	49.3	50.4	51.6
9	51	51.4	35	51.3	17	50.8	5	52.0	51.4	51.3	52.6	53.5
10	53	53.1	40	52.8	12	52.3	15	53.9	53.0	53.2	54.7	55.6
11	62	54.9	29	54.7	15	54.9	16	53.9	54.6	55.1	56.4	57.3
12	64	57.0	29	57.3	11	55.5	17	56.2	56.5	56.8	58.2	59.2
13	46	59.5	21	59.0	13	57.6	18	59.2	58.8	59.1	60.4	61.6
14	28	61.1	15	62.3	10	59.0	8	60.3	60.7	61.2	62.8	63.9
15	10	63.9	7	64.0	5	61.5	8	62.2	62.9	62.6	65.0	66.3

† To nearest birthday.

TABLE 15

Weight of Maine Girls Included in This Study
Fall Averages for Four Towns Compared with U. S., Iowa, and Gray's Averages

Ages†	1936–1939 (incl.) Newport		1934–1936 (incl.) Mars Hill		1934 Jonesport		1934 Monmouth		4 Maine Towns	U. S.	Iowa	Gray's
	No.	Av.	No.	Av.	No.	Av.	No.	Av.	Av.	Av.	Av.	Av.
		lb.		lb.		lb.		lb.	lb.	lb.	lb.	lb.
5	27	37.9	13	39.5	6	40.5	2	39.6	39.4	—	39.3	43.0
6	57	40.8	31	43.6	15	41.7	9	44.7	42.7	43.9	44.1	49.3
7	57	45.6	45	45.9	12	43.1	11	48.7	45.8	47.6	50.4	55.3
8	54	49.6	51	52.0	20	51.9	7	47.7	50.3	52.4	56.4	61.4
9	62	55.9	50	56.5	10	55.8	12	61.3	57.4	58.1	62.6	69.9
10	53	60.6	38	65.4	12	61.5	13	70.6	64.5	64.2	69.6	77.4
11	53	71.1	51	71.4	14	65.0	8	62.7	67.6	72.8	78.8	86.1
12	57	81.2	44	83.5	17	71.0	8	83.2	79.7	81.8	89.5	96.1
13	42	93.1	32	92.2	10	85.3	5	101.3	93.0	92.6	100.1	105.4
14	19	100.0	19	95.1	5	95.7	10	103.4	98.6	101.0	110.7	111.6

† To nearest birthday.

TABLE 16

Weight of Maine Boys Included in This Study
Fall Averages for Four Towns Compared with U. S., Iowa, and Gray's Averages

Ages†	1936–1939 (incl.) Newport		1934–1936 (incl.) Mars Hill		1934 Jonesport		1934 Monmouth		4 Maine Towns	U. S.	Iowa	Gray's
	No.	Av.	No.	Av.	No.	Av.	No.	Av.	Av.	Av.	Av.	Av.
		lb.		lb.		lb.		lb.	lb.	lb.	lb.	lb.
5	16	40.4	8	40.3	7	36.9	2	43.0	40.2	—	41.8	43.2
6	48	44.7	27	45.5	14	46.1	13	42.8	44.8	44.6	46.0	48.9
7	46	49.9	31	49.1	9	50.0	10	51.1	50.0	48.5	51.7	54.2
8	50	54.7	37	52.4	14	56.5	9	51.3	53.7	54.0	58.0	61.4
9	51	59.0	35	58.9	17	59.0	5	61.9	59.7	59.0	63.8	68.0
10	53	65.1	39	63.3	12	62.5	15	69.5	65.1	65.1	71.6	75.8
11	62	70.0	29	66.9	15	70.4	16	70.5	69.5	71.6	77.6	82.8
12	64	77.9	29	77.3	11	75.8	17	78.2	77.3	78.3	85.1	89.5
13	46	89.0	21	84.0	13	88.7	18	92.2	88.5	87.0	96.0	98.5
14	28	96.9	15	95.6	10	86.7	8	93.4	93.2	97.2	107.0	108.6
15	10	105.3	7	103.2	5	102.4	8	95.7	101.7	101.8	120.9	123.2

† To nearest birthday.

TABLE 17

Average Measurements of Newport, Maine Girls and Boys Used in Charts 5 and 6

Ages*	Height		Weight		Chest circumference (xiphoid level)		Bi-iliac hip width	
	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys
	in.	in.	lb.	lb.	in.	in.	in.	in.
6	43.8	44.9	41.1	45.0	21.1	22.1	7.2	7.4
7	46.1	47.5	45.0	49.5	21.6	22.7	7.5	7.7
8	48.4	49.6	50.5	54.8	22.4	23.4	7.9	8.0
9	50.4	51.3	56.0	59.1	23.1	23.8	8.1	8.2
10	52.5	52.9	61.5	64.0	23.7	24.6	8.4	8.5
11	55.2	55.0	71.0	70.8	24.7	25.3	8.9	8.8
12	57.9	56.7	84.1	76.9	25.7	26.0	9.4	9.0
13	60.1	59.7	92.2	90.5	26.7	27.5	9.9	9.6
14	61.3	61.6	101.0	102.3	27.0	28.3	10.3	9.8

* To nearest birthday. In most cases two measurements were made in one year. That one was used which was nearest to the child's birthday.